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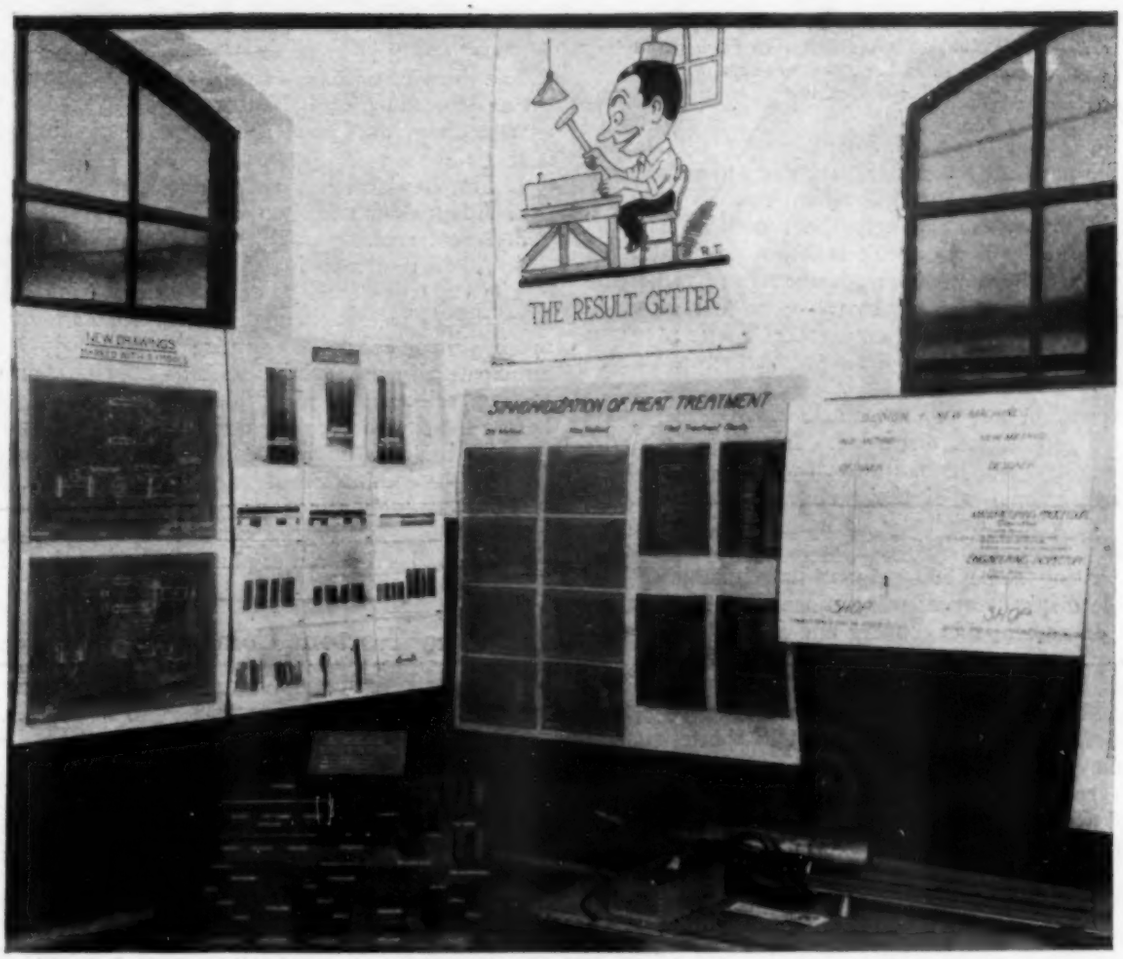


Fig. 1—Individual judgment has been displaced by specific standards for quality of finish and heat treatment

Modernization through Visualization

THOMAS O. FORD

TO keep the shop abreast of the times is part of a production man's job. A good manufacturing executive knows when new methods of routing are required or when standards need revision; he knows when equipment should be purchased or when a wage incentive system should be renovated. But often a prerequisite to the fulfillment of these needs is that certain other individuals must become convinced of their desirability. Unfortunately, many production executives fail in this vital step, with the result that their well conceived ideas are either discarded or delayed unduly.

Purse-string control is applied systematically in our manufacturing plants with the possible exception of a few of the smaller ones. Often the men who sit on the boards of directors, or other bodies having the final say in granting appropriations, are out of daily touch with

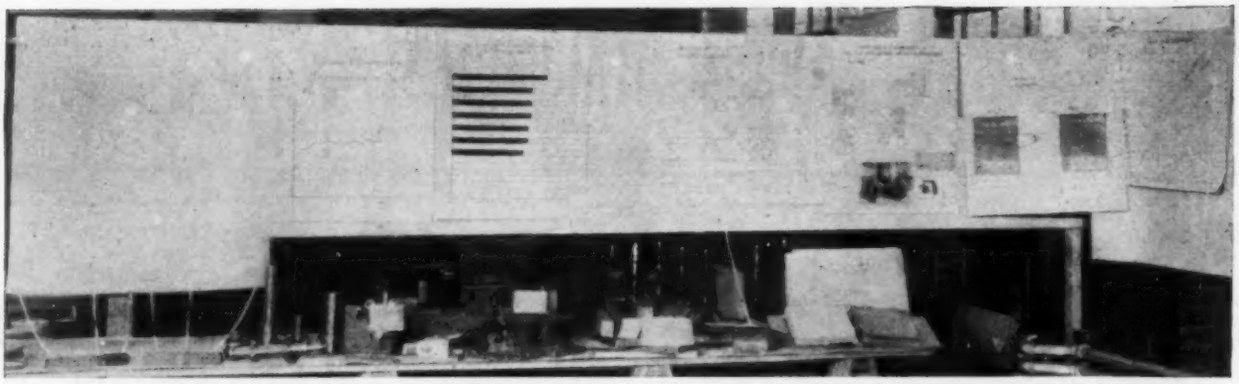


Fig. 2—The benefits of a revised wage plan, profitable to company and worker alike, are shown in this portion of the exhibit

the numerous details of shop management. They are traditionally hard-headed individuals, open to conviction, but who want to be shown a fair return on their expenditures. To portray convincingly the benefits of manufacturing efficiency is a difficult task but one that must be overcome if the needed improvements are to be carried to completion. The workmanlike manner in which the Norton Company executives presented their program of modernization should be a revelation to those faced with a like problem.

The idea of attempting to paint a word picture in a voluminous report was discarded. Instead, it was decided to construct an exhibit which would demonstrate graphically the merits of the changes in methods and equipment. While originally designed solely for company use, the fame of this exhibit has spread. At the present writing some 200 persons have examined this remarkable display, representing more than 50 different concerns of note in this country and abroad.

The exhibit consists of a series of charts, diagrams, blueprints, samples of work, fixtures, and photographs, so arranged as to trace the advantages of the new set-up, both achieved and anticipated. First is shown an outline of the plant rearrangement with its resultant economies in routing and material handling, as previously described (*AM*—Vol. 75, page 339). Included in this section is a floor plan of the six mills, in which scale outlines of the various units of equipment were fitted, to secure the most effective arrangement.

An important phase of the Norton program is the close coordination between the engineering and the manufacturing departments. Figs. 1 and 2 illustrate that portion of the display dealing with the new engineering procedure. Drawings tell the story of the important work of making blueprints and engineering designations definite and specific. Reliance on the memory or experience of a foreman or workman with relation to tolerance, finish, or treatment of a particular piece is obviated. Finished surfaces are marked with one, two or three small triangles to indicate rough, medium, or fine finish. To exemplify these standards test pieces were prepared for each of the three degrees of machining for all ordinary operations such as turning, milling, planing, and grinding as shown in the lower part of Fig. 1. These test pieces were photographically recorded to insure permanence of the standards and ease of duplication when rusted. The new drawings established standard specifications for heat treatment designated by number on the shop blueprint.

The drawings are sent to the Committee on Manufacturing Procedure composed of those responsible for design, tooling, and manufacture. The committee's job is to:

1. Simplify design
2. Adapt design to shop equipment
3. Avoid erecting troubles
4. Adapt design to foundry practice

The drawings then go to the Engineering Inspector, who checks tolerances and insures that all dimensions are in proper form. The entire procedure is devised to anticipate all contingencies such as difficulties in casting, tooling, selection of material, machining, or assembling before the drawings are sent to the shop. The additional time consumed in reviewing designs is saved many times over by the elimination of possible manufacturing delays.

To avert high rejections or unnecessary care on the part of the operator the general tolerance for all machining has been placed at plus or minus $\frac{1}{64}$ in. This has

The Norton Company's progress in plant improvement was vividly demonstrated by a special exhibit which convinced those in financial control of the soundness of the production program

not in the slightest degree affected the quality of the finished product, but the designer must now specify on the drawing any limits that must be closer than $\frac{1}{64}$ in. This has saved considerable unnecessary labor in the shop on parts whose function does not require machining to finer limits than $\frac{1}{64}$ in. At the lower right of Fig. 2, is the new Norton book of engineering standards which provides the foundation for the engineering set-up.

Drawing have been clarified and arranged to minimize the possibility of misunderstanding. The study of materials and sequence of operations has resulted in the simplification of some steps and the elimination of others. Tools and fixtures have been improved in function and accessibility to the operator. The welding of jigs has become common practice. Standard tool sets for recurring operations and a decentralized tool crib system have led to the avoidance of lost time between machine set-ups.

The Norton management adopted a new incentive system to meet two conditions:

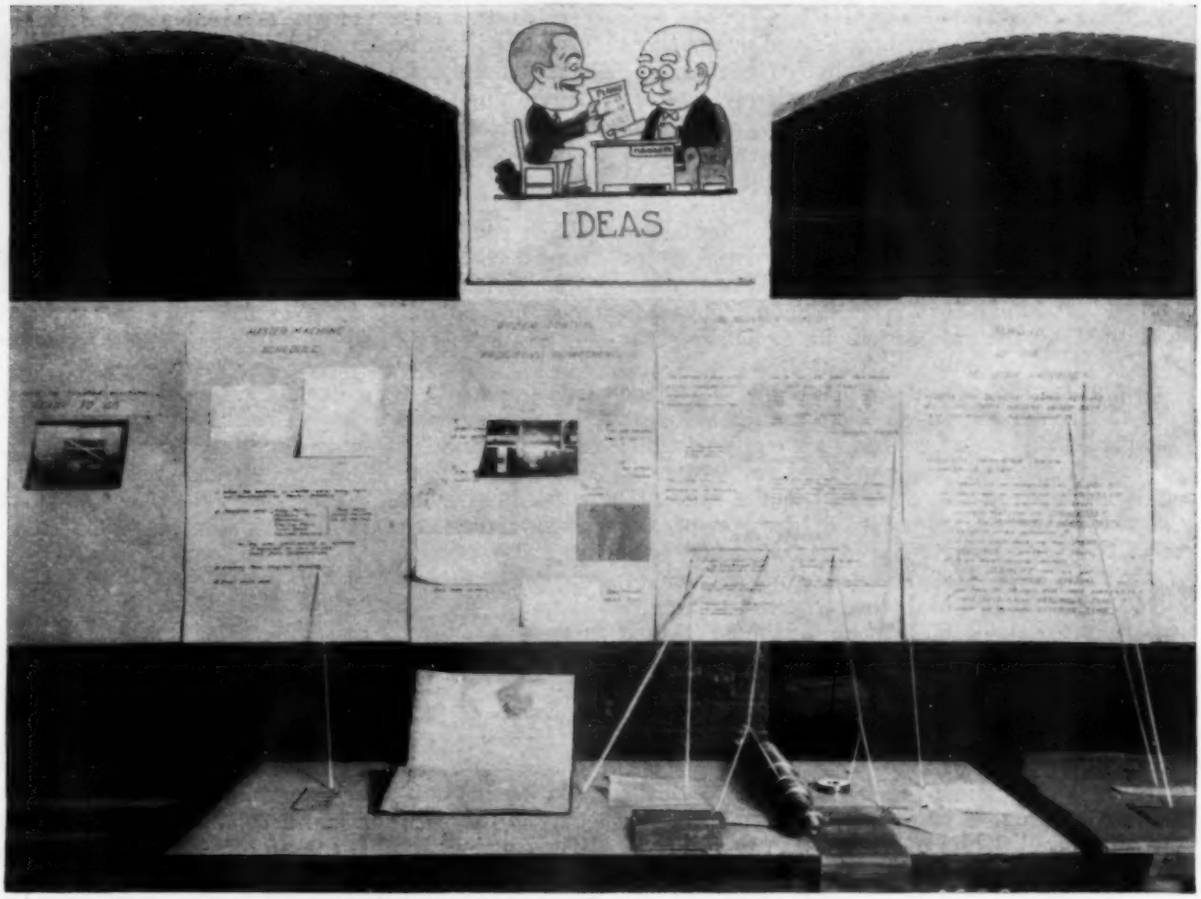


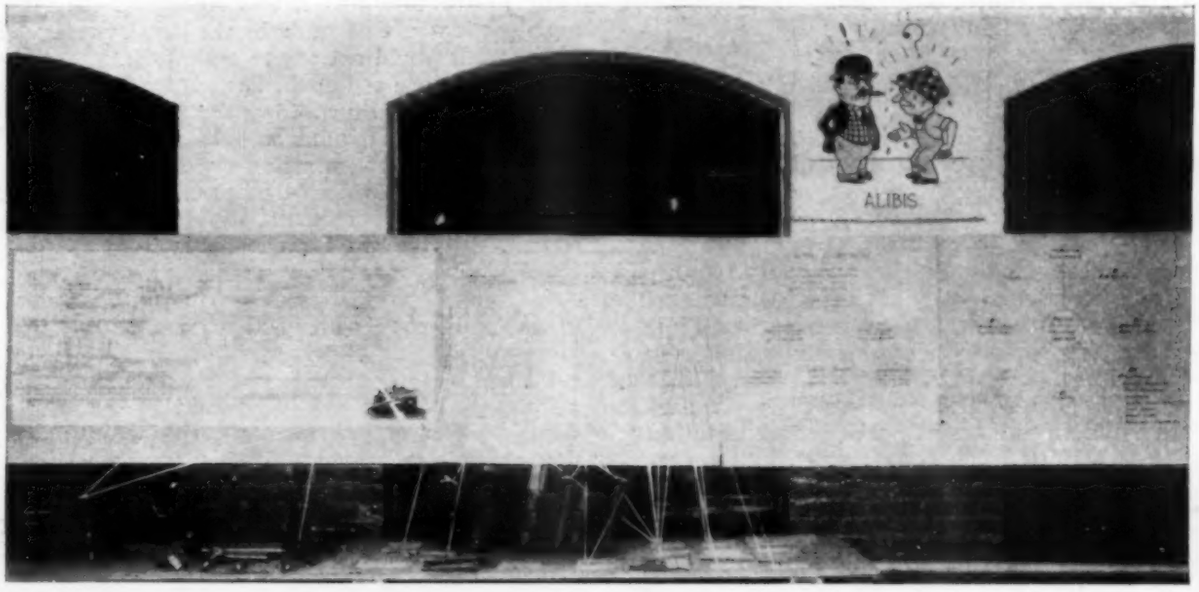
Fig. 3—The intricacies of scheduling and production control lend themselves to graphic clarification

1. To permit the worker to earn a greater rate of pay
2. To reduce appreciably manufacturing costs

After considerable study a 50-50 plan was approved in which the company and worker share alike in production savings. The workman strives to better the performance indicated by the allowed time on each job ticket. If he succeeds, he is paid at his regular hourly rate for half the difference in time.

The two systems are identical at 100 per cent efficiency, but below this point the former piece-work incentive falls off twice as fast, disappearing entirely at 77 per cent, whereas under the 50-50 plan premiums start at 62½ per cent efficiency. This practically eliminates the necessity of day rating jobs, a practice that is often found necessary in the straight piece-work plan. Above 100 per cent

Fig. 4—As a substitute for reams of wordy explanation, ribbons link the detailed steps of dispatching to order forms and machine parts



efficiency, the increase in earnings is less pronounced. Under the new system, for every hour saved by the operator an hour is saved for the company. Therefore, the desire for the operator to hold back for self-preservation is eliminated.

The display includes also tools and fixtures that have aided the operators to meet standard time. At the right of the table is a book of charts giving basic data on milling which is typical of many compilations of feeds and speeds for various machining operations. In front of this is the book containing the charts of element times for set up and machining for the entire shop. These are the tables used by the rate setters in establishing the proper rates.

One portion of the exhibit graphically presents the economies that are directly traceable to the revised wage plan and other changes. These savings are given for the plant as a whole, showing their progressive increase as the method was extended successively to the manufacturing departments. A comparison of departments for a corresponding period is posted as a bar chart under the title, "How many minutes make up an hour in your department?" Specific jobs with their reduced costs give evidence of the details that make up these overall economies.

Figures 3 and 4 cover the displays dealing with the new machine division planning department. This department is separate from the routing and rate setting department, coming directly under the supervision of the superintendent. It is responsible for scheduling, dispatching, planning and ordering. The exhibit discloses how these functions are controlled and coordinated. A typical order is traced from its receipt from the customer to the shipment of the finished product. Inventory control, delivery promises, parts orders, load charts, and mechanism schedules are explained clearly. For this purpose, the procedure as outlined on the wall graphs is supplemented by standard forms and machine parts making more vivid the exact means of control.

A half hour's inspection of the Norton exhibit is sufficient to convince one that those responsible for manufacture have done a good job and a thorough one. Only a tedious study of details, consuming several days, could reflect as complete a picture in any other way. Up to the present, certainly, no more effective scheme has been devised to bring a closer understanding between manufacturing and financial interests.

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Moving a Machine Tool Factory's Stock

A. C. BLACKALL
London, England

The advantages of the container system of transport for machine tools were strikingly demonstrated in the United Kingdom recently, when a London firm found it necessary to move over 450 tons of material from a warehouse in Salford, near Manchester, to London, a distance of 188 miles. The firm in question, Chas. Churchill & Company, Ltd., a well-known machine tool manufacturing concern, decided to concentrate its business in London and was faced with the problem of moving over 20,000 different items pigeon-holed in steel racks.

The task was entrusted to the London, Midland & Scottish Railway, and to achieve the end in view, it was decided to utilize the week-end holiday period. The loading of this immense amount of material was undertaken successfully by the only means available capable of effecting the results desired, in the shape of 150 four-ton capacity containers. These were loaded not only with the freight and racks, but also with the records and paraphernalia essential to the continuation of distribution on arrival.

The containers were taken on trucks from the warehouse at Salford to the railroad's freight depot in Manchester; it required three special trains to convey them to London. On arrival, they were held at the depot so that delivery could be effected when the streets were quiet. Delivery was made by road to the new premises by means of a 6-ton mobile gasoline-electric crane, the loaded containers being delivered right to the building itself, in positions most convenient for unpacking. The rapidity and completeness with which the operations were carried out enabled the firm to continue business immediately after the week-end holiday, the transfer taking just over two days.

■

Lubricating a Tool Rest

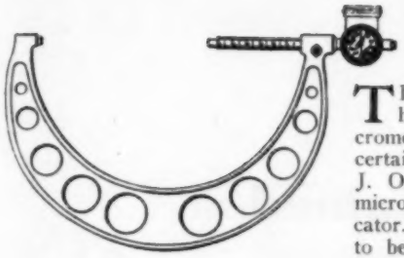
JOHN A. TANSLEY

An amusing incident occurred about the year 1900. A planing mill had a lineshaft running through the length of the mill and through a partition. There was a hanger outside the partition and a short shaft across the shed. The coupling had been taken off, disconnecting the short shaft. The mill, having some work that required the service of this shaft again, ordered a coupling and asked the foreman of the machine shop to send up a man to get the size of the shaft. The foreman sent a handy man who reported that the shaft was $1\frac{1}{16}$ in. in diameter. The coupling was to have a friction grip with four keys that tapered on top from the center to both ends. The flanges were bored out on a taper and when drawn up on the keys, the edges cut into the shaft and made an effective connection.

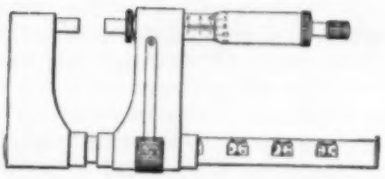
I was sent up at night to put the coupling on and soon discovered that the shaft crossing through the partition from the mill was 2 in., or $\frac{1}{16}$ in. too large. Like every other job of this kind it was rush, and the shop had promised it would be ready by the next morning. Realizing that it would not pay to try to enlarge the bore of the flange on one end of the keys, I decided that the only thing to do was to turn down the shaft. Upon looking over the section, I found it was about 20 ft. long, and had a lot of pulleys on it, which in those days were mostly of solid cast iron setscrewed in place, so that taking the shaft down was out of the picture. Upon inquiry, I learned that the shaft ran about 300 r.p.m. Looking around I discovered an emery wheel, and having two square files, I ground them for tools. Cutting a piece of 2x4 the right length made a good turning tool rest. Here the amusing part started. The mill had furnished two men to help on the job, one a powerful red-readed Irishman. We got him to hold the 2x4, and when the cutting started at 300 r.p.m., the chips were red hot. I don't remember being called so many names before or since, all in the good old-fashioned Irish tongue. Upon promising to buy the man a good drink when we got through, he stuck it out. The mill didn't have a nicer running coupling than that one.

New Inventions in Gaging

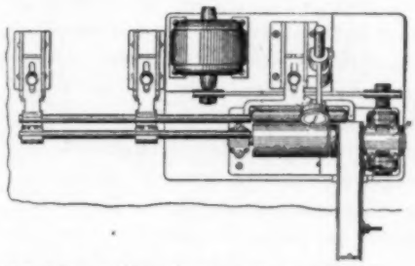
The warm summer and fall days did not stem the flood of patent office releases. Here are a few pertaining to the measurement of metallic parts



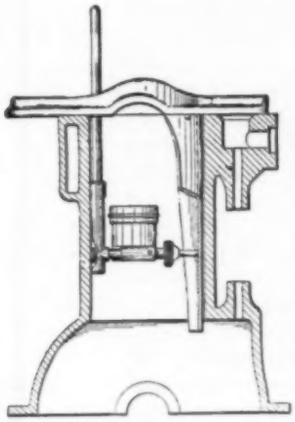
THE element of human "feel" has long been a variable in micrometer measurements. This uncertainty is eliminated by Robert J. O. Simpson in a combination micrometer caliper and dial indicator. The indicator is adjustable to be visible at any angle. The L. S. Starrett Company is assignee of Patent 1,821,398 covering this instrument



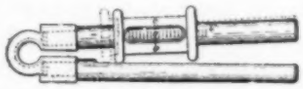
AN IMPROVEMENT in micrometer calipers was devised by Camille Joriot, of France. The instrument adaptable to a wide range of measurements, is based on the beam principle. The feature covered by Patent 1,818,853 lies in the means for locating and clamping the extensible jaw at precise positions



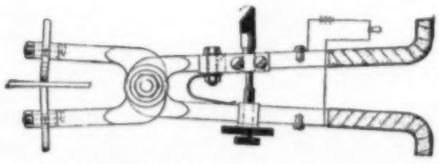
FOR gaging rings such as bearing races, the Skayef Ball Bearing Company has developed a continuous process. The rings are rotated and axially traversed simultaneously on two power-driven cylinders. An indicator contacts the outer diameter. For this invention, Patent 1,818,968 was awarded Erick Torvald Anderson



ADOLPH STORM and the Storm Manufacturing Company have received Patent 1,816,061 for a cylinder testing device which measures the bore at any angle and any height. A supporting member rests on the flat top surface of the block. A flat vertical rod carries an indicator with two contact points and is adjustable up and down

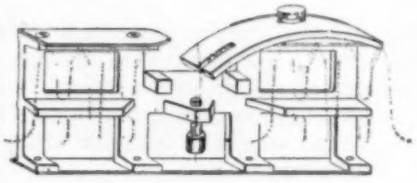


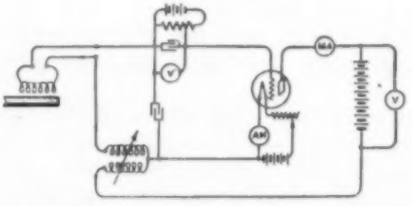
ORDINARY thread gages show whether a screw thread is tight or loose. Here is one that gives a positive micrometer reading. The gaging member is sprung by a sliding collar which controls the amount of opening and indicates the measurement. James Hartness was awarded Patent 1,819,025 for this idea



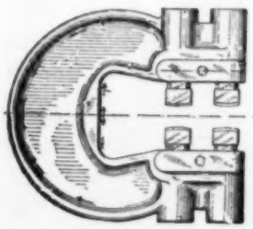
AN electric lamp indicates the correct setting for this sheet metal gage. Two plier-like arms, insulated from each other, are controlled by a micrometer screw. Roller contact surfaces keep wear to a minimum. Florence C. Biggert, Jr., conceived this idea and assigned Patent 1,816,464 covering it to the United Engineering & Foundry Company

PATENT 1,815,215 covers a saw gage invented by Alfred M. Remington, who assigned it to the Simonds Saw and Steel Company. This device consists of a frame, a fixed guide, and an adjustable curved plate having a recess to receive a raker tooth of the saw





ELECTRONICS has been applied to the measurement of metal thickness by Hermann Ernest Kranz. A tuned grid oscillator circuit amplifies small differences in potential caused by a coil moving along the part to be gaged. Patent 1,815,717, which covers this method, is assigned to the Western Electric Company



A NOVEL means of holding contact points in snap gages was devised by Paul V. Miller. The points have cylindrical stems flattened on one side. When in use, steel plates hold the points by clamping against the flat surfaces. The points may be withdrawn by giving them a quarter turn after the plates have been removed. The Taft-Pierce Manufacturing Company profits by this invention covered by Patents 1,817,627

EXECUTIVE

Self-Contained

Recently a number of manufacturers have put their auxiliary activities on a contract basis and have been pleasantly surprised with the results. They receive prompt service at a reasonable cost and are relieved of the supervision of large indirect labor departments. Personnel problems are lessened with the reduced permanent force, and part of the plant is released for direct manufacturing activities. A contractor serving a number of such plants is able to do their work more economically than could each firm independently. But some companies foresee difficulties in this arrangement. They prefer to carry their own expense departments, feeling that they afford closer control and speedier service. How much work of this kind can be farmed out with profit? What do you think of this shop problem?

THE first half was over. Bill Holland and Al Kendall, Works Manager of the Planet Engine Company, sat in the vast football stadium thrilled by the closeness of the struggle they were witnessing. Next to industrial problems, sports of all kinds claimed Bill's attention, and he often drew a parallel between these two spheres of interest.

"I suppose this is no time to be talking shop," said Bill, "but sport and industry have certainly a lot in common—teamwork, for instance. I used to think the ideal industrial plant should reflect a closely coordinated unit, its various departments representing members of a well-coached team. But lately I've modified my viewpoint. The team should be more comprehensive than a single plant—it should include the entire industrial community. Manufacturers would find it profitable to accept this principle."

"Most of them do," said Kendall. "I know we're interested in the community even beyond that portion of it in our employ."

"That's not what I mean," said Bill. "Local activities by industrial concerns are commendable enough. But when it comes to their actual manufacturing operations, most of them want to be self-contained. Take your own plant for example. Your business is building engines. But you've a great many men on your payroll who are engaged in other activities—making tools and jigs, repairing, painting, steam fitting, roofing, or doing electrical work."

"We don't spend time and energy on those things because we want to," said Kendall. "They're indispensable to the continued operation of our plant."

"It's not essential that your own organization do them," said Bill. "Ninety per cent of your auxiliary work could be done on a contract basis, if you fellows would get over the pride of doing everything yourselves. One good electrical contractor could take care of a dozen plants like yours. The same applies to other maintenance and toolroom work."

Kendall shook his head in disagreement. "It wouldn't work in our shop, Bill. When we have repairs to make, speed is important. We can't wait around for some outsider to come in and fix us up."

"You say that because you've never tried it," said Bill. "But other manufacturers are doing that very thing and find they are getting better service than they did from their own force. Put yourself in the contractor's place, and you'll see why. He has to give prompt service to keep the business, and if necessary, he'll work night and day to keep you going."

"But we're spending all we can afford on expense activities now," said Kendall. "With our own men working on an hourly basis, our costs are down to rock bottom. An outsider would have to make a profit, and we'd have to pay it."

"Just start to analyze some of your expense activities," said Bill, "and you'll see where the contractor can save you money. All plants have an intermittent load on their toolrooms and other auxiliary departments. They're geared for certain peaks, and between times there is a certain amount of slack. That creates the fill-in job—work that you tolerate because it keeps the men occupied but which has a doubtful value. When you farm out your work, you pay only for what you need."

"I wouldn't have the confidence in an outsider that I have in my own force," said Kendall. "The way things are fixed now I have complete control of any emergency."

"It's just that desire to be a one-man team that's costing manufacturers plenty today," said Bill.

Suggested by J. W. Hesketh,
Coventry, England.

FORUM

Discussions Of Former Subjects

Itemized Pricing

To differentiate between the customer, who demands a great deal of service, and the one who demands little or none, would certainly give rise to complications, which could only work to the detriment of the manufacturer selling the machine or equipment. However, it is perfectly right and fair that a difference be made, and the problem is to make that difference without rousing animosity on the part of any.

The solution of this would be to price machines at a level, which would include the maximum or near-maximum of service necessary as a direct result of the sale, and then quietly to make a refund to that buyer who demanded little or nothing in the way of additional service. Under this plan, it might be well to keep a record of extra services rendered, and file it away against possible need. Then the situation could be explained adequately to any customer who might later raise a fancied grievance. In fact, it is wise to keep such a record regardless of the method of pricing followed.

—JOHN E. HYLER.

Sales by Contest

In the selling of such things as radios, automobiles, or life insurance, contests are of real value as the salesman is dealing usually with an individual. Enthusiasm plays a strong part in overcoming sales resistance. In selling machine tools, however, a highly enthusiastic attitude may aid a salesman to create a desire for the machine he sells and often influence the shop foreman or superintendent to specify his machine on the requisition, but this is usually as far as he can go. The final decision is usually made by the manager and other executives, who grant the appropriations. The merits of several competing makes are considered and weighed one against the other until the equipment offering the greatest returns on the investment has been decided upon.

If a sales manager were to judge the abilities of his man by the results of a sales contest, it is obvious that each salesman would have to concentrate on those propositions promising a speedy decision and neglect those indicating that a certain amount of missionary work must be done before the order would be forthcoming. The result would be a slight increase in sales during the contest but a lower sales average over a longer period of time because of a loss of good will in the trade.

—JOHN A. LAWSON,
Sales Department,
The Heald Machine Company.

Marking Time

Slack times are often best to produce and market new designs, as the market will be less congested than in more prosperous times. A new product will get more attention though there may be less buying. Trade is now slack, but it might improve at any time. A firm, which introduces new designs now, will reap the full benefit of a trade revival. Slack times breed slack times; things are made worse by firms marking time instead of trying to improve trade.

—W. E. WARNER,
Herts, England.

The policy of holding up the release of new designs is both good business and economically sound. How much does business in general care whether the Mid-City Machine Works survives or not? The president is both morally and legally obliged to safeguard the best interests of his firm, regardless of the effect on industry in general and himself in particular. He is duty bound to hold back new designs until they can give maximum return to his company.

This attitude is a small factor in retarding business revival. One corporation president I know needs a complete new plant; both buildings and mechanical equipment. The company could easily finance the deal and put up modern buildings, also buy the most efficient pattern, woodworking, foundry, and shop equipment, and save at least twenty per cent of manufacturing costs. Its dollar will buy now more than it will a year or two hence; yet the officials hesitate and use the present depression as an excuse for not doing what must be done within the next five years. Would the release of a new type high power milling machine, radial drill, or planer tend to cause them to build and buy sooner? No! The economic law of survival of the fittest means that each company must look out for its own interests however selfish they may seem.

—E. E. GAGNON,
Mechanical Superintendent,
Raybestos-Manhattan Company

Friendliness or Aloofness?

In small firms and to a lesser degree in larger ones, an atmosphere of friendliness can prevail which will not cost the firm anything in prestige or output. If a firm has been noted for its aloofness, the management must be very careful how it changes to friendliness, or it will create a feeling of slackness of which the men will take advantage. On the other hand a firm may readily reverse the procedure.

Many times the officials, who lose contact with their men, lose valuable suggestions. By not knowing the capacities of their men, they go outside to obtain an employee whereas a promotion from the ranks would have given equal results in the position filled and better results in the shop because of the chance of promotion. One visit from a manager, one pleasant word from the president, goes farther than one hundred impersonal visits from a nurse or from the personnel director.

—C. G. WILLIAMS.

Hours Gratis?

The question of paying the engineering department for over-time should be governed by its amount and frequency. There is no necessity for the department to be paid for occasional short periods of overtime. A firm whose business requires constant overtime should be willing to

pay for it, otherwise dissatisfaction is sure to arise. This is only natural, as when a slump in trade comes, the opposite usually happens and the departments gets put on short time.

There is little interest put into regular overtime work without pay, and often there is a general tendency to slack off during the normal working hours. Consequently the total amount of work done, including overtime, is little more than would be accomplished in a normal day.

—J. W. HESKETH,
Coventry, England.

One Line or Many?

In dull times, many manufacturers cast envious eyes on other lines and break in on what seems to be a good market for their surplus energies, men, and machines. In general, "the shoemaker should stick to his last," and to the line he excells in. Few, if any, articles of manufacture are now at the absolute pinnacle of perfection. Why not seek further development of what you now make? A cartoonist once pictured two fields divided by a wire fence, each having the same crop, while two cows, one in each field had their heads through the fence and were stretching as far as they could into the opposite field, eating voraciously. This often is the truth in manufacturing, but a number of manufacturers have successfully invaded other fields. One large bridge building concern, makes among other things, railroad cars, and motor boats, while a well-known piano manufacturer started to make motor boats and lost heavily, by being unfamiliar with the line and its requirements. On the other hand, a lathe manufacturer made a revolutionary change, in the headstock and nose of the spindle, and by combining electric forming, with his machine, has made a lathe that is well nigh indispensible for tool work. Don't reach too far into the other fellow's field, and neglect your own, where the going is familiar and easier.

—JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

A Dollar Down

For corporations with large reserves, or a past reputation, which makes it easy for them to borrow money, there is no need to buy on installment.. But how about the small manufacturer or medium sized firm, which is just trying to get its feet on the ground?

A company may have its finances tied up, and on going over its manufacturing machinery, find that by spending ten or twelve thousand dollars in new equipment, it will be able to cut down production costs decidedly. If this can be done on installment buying, there is no question about going ahead with it. I know of a small company that bought equipment on time and had a well established business before the machines were paid for. The buying of equipment by manufacturers on installment is an incentive to go after business and effect greater economies the same as it effects the individual buyer of an automobile or radio. They are conscious of an obligation which must be met and will usually manage to meet it.

—J. CONRAD WATSON,
Master Mechanic, Franklin Pottery.

Shirt Sleeves or White Collars?

More brains for industry is the call of the period. Today the amount of white-collar staff in our works, grows in relation to progressive attainment, efficiency, and the vision of the future held by the different companies. No two firms seem agreed as to the correct ratio of white-collar workers in relation to the number of manual workers. The man in the shop is not wanting in his opinion that the ratio is far too high, especially when he is called into the office to face the music, because the time study department has noted that his time was ten per cent higher than the standard. Those of us who have had practical experience in the shop know that there are times when everything seems to go wrong on a job, and when a man has had irritating hindrances to his work; it is doubly irritating to be called down for the length of time taken. We calculate the horsepower of the engines and motors, the body power, and the brain power of the workers, but are likely to forget the heart power. Both body and brain power is diminished if there is not heart power.

Still, the number of white-collar employees will increase rather than decrease, for the depression of our times calls for much research work. We must learn to study things more from the customer's point of view. One of the most successful men of post-war years, recently said he owes his present position to taking notice of all the complaints his customers make. We need greater studies of what foreign countries want, and not what we want to give them. We need more study as to the environment of the workers, for no man works at his best when laboring under uncomfortable circumstances.

—THOMAS ROSEVEAR.

The ultimate aim of industry should be to have all white collars and no shirt sleeves. The work of production should be done entirely by machines, never being touched by hand during manufacture. Machines should not even require looking after.

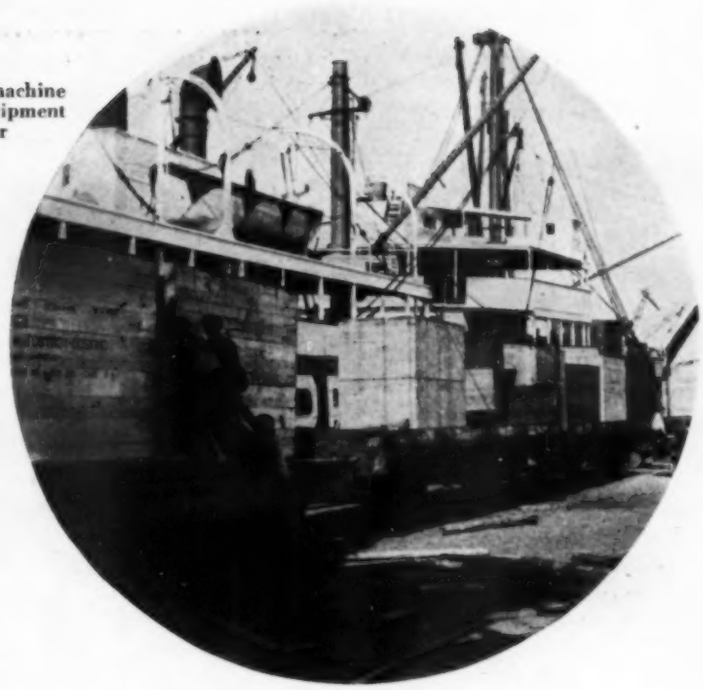
Everyone realizes there is a contemporaneous ideal proportioning of the white-collar and shirt-sleeves work necessary for any particular production. By increasing the proportion of white-collared workers, we may temporarily increase the cost of the job, but if the white-collared workers are working on development and not merely on routine work, ultimate improvement of methods should finally result in a reduction in cost.

The shirt-sleeve worker is really working for output for the present. The white-collared worker is responsible for improvements in methods of production or in the product, and should chiefly be working for the future by building up new methods and designs. Any increase in the white-collared workers does not result in an immediate gain but in a gain in the near future.

A prominent industrialist said, "It is easy to improve methods so as to raise the efficiency of production from 50 to 75 per cent or even to 98 per cent, but to raise it from 98 per cent to 100 per cent would probably cost more than the 2 per cent gain in production."

The quotation of percentages refers to the best methods of production possible with the knowledge and resources available to the world at any particular time. The white collar is constantly altering this basis on which efficiency percentage is based, rather than in increasing this percentage. It is far better to be working at an efficiency of 50 per cent and to be constantly improving the basic methods, in other words making the available method better, than to work at 90 per cent efficiency and never improve the basic method.

—HARRY SHAW,
Consulting Engineer, Lancashire, England.



Unloading American machine tools and other equipment at a Russian pier

American Engineers vs. Russian Shrewdness

A European observer confirms and amplifies John H. Carmody's recently published impressions that American engineers should exercise the greatest caution in signing Russian contracts

ALREADY the groundwork for a second 5-year plan, even more gigantic in scope than the first, is being laid in Russia. In anticipation the Supreme Economic Council has issued a statement according to which further outside technical aid is to be recruited from other countries, including 3,000 engineers, 3,000 foremen and 7,000 trained workmen. Many Americans, Germans and others, hard pressed by economic conditions at home, are going to apply for these positions, but before they do so they should be fully cognizant of what they must face. Recently I had the opportunity to talk to a number of American and German engineers who had been actively engaged in Russian industry. Their collective opinion about Russia should be of value. These opinions are without exception from men whose services in Russia have already been concluded, and who are not subject, therefore, to any obligations whatever regarding freedom of speech.

In order to understand clearly the present situation, one must as an outsider remind oneself of the idea underlying the 5-year plan of industrialization. This is called *Dognatjiperegnatj* and means "Catch up and leave behind." It is the ever-recurring motto. In other words, it imputes that the Russian government engages foreign engineers only because of necessity, and leaves no doubt that they are to be sacked as soon as their services can be spared. Even in the opinion of the intelligent, the foreigner is considered an opponent to Bolshevism and thus as an enemy of the Soviet Union. In the eyes of the workmen, he usually appears as a slave-driver; in the eyes of his Russian colleagues as a know-better. From both quarters he is shown enmity because of his preferred material position.

All personal intercourse between natives and foreigners is systematically discouraged by the government. Thus, for instance, Russians are forbidden even to visit the two hotels in Moscow reserved exclusively for foreigners. As a result the latter often live isolated and self-dependent, particularly in the new industrial centers. In fact, most Americans and Germans live in settlements of their own, called *enclaves*.

Much has been written in the press about the primitive and rigorous conditions of life in Russia, and a person desiring to go there has a certain anxiety caused by a number of unanswered questions of considerable importance. Extreme differences are experienced regarding everyday conveniences, or rather inconveniences, in the towns and the new industrial centers. Furthermore, one foreigner may be treated far worse than his colleague, in spite of similar work and equal productivity, a fact depending largely on the shrewdness displayed during negotiations prior to engagement. And indeed, experience has proved it to be absolutely essential at least to discuss matters with persons familiar with Russian before going there and even before taking up negotiations for an engagement with the representatives in charge of the various People's Commissions (ministries) or administrative departments. It would be still better, to have one of these persons present during the negotiations.

In view of the comparatively high salaries (in rubles), men go there intent on making savings, but they overlook two important facts: first, for the sake of sustaining the compulsory rate of exchange in Russia, the government prohibits the taking of rubles (or *czer-*

Among the workmen's clubs is this new metal workers' clubhouse in an attractive park

wonkas) to foreign countries, or their importation to Russia; second, they must contend with insufficient food supplies, a badly neglected traffic system, and a steadily growing inflation of values. These grievances, supplemented by inadequate dwellings, heating and clothing, cause considerable dissatisfaction among all classes of the population. Furthermore these conditions are the direct cause of physical weakness of the workmen, lack of working stimulus and of discipline.

At present the ruble has a buying power of about 12 kopecks, but can only be bought from the government, which asks 48 cents for one. Hence, unless he prefers to have part of his salary paid in the products of nature —foodstuffs—the foreigner must demand at least eight times his normal earnings when accepting an engagement, if he is to maintain his same economic status. The government, however, simply cannot guarantee the supply of provisions for persons not living in the larger cities, and there are a great many foreign engineers to whom this pertains. While it is true that at present nobody need die of starvation, prices are exorbitantly high. For example, a fowl costs 12-30 rubles, a goose 20-60 rubles, and a pound of butter 4-10 rubles.

At first the Soviet government tried to subject foreign engineers to the same sacrifices and privations for the reconstruction of the country as its own people bore. Under the pressure of American engineers, however, particularly a group engaged with the construction of the great Dnieper power plant, the foodstuff supply for foreigners has been guaranteed and respectable habitations provided. Along the inland waterways, no more than 100 sq.ft. per head are provided for Russian officials and employees, but in Moscow, foreign engineers are lodged in a modern settlement consisting of 80 dwellings with 2, 3 and 4 rooms, all with kitchens and bathrooms.

Such privileges however, are enjoyed only by those in really distinguished positions. It is not permissible, for example, to use as a measure of comparison the standard of living of Col. Hugh L. Cooper, who resides in a 6-room villa and enjoys exemption from taxation for all his supplies procured abroad, besides every privilege at all attainable in the Soviet Union. Colonel Cooper, probably the most distinguished American in the U.S.S.R., is stationed with his staff in the American colony of Dnieprostroy on the Dnieper River. His task, already half finished, is the erection of a huge hydroelectric plant which will increase the generation of electrical power five-fold. His successes, as well as the predilection of Joseph Stalin, Russia's foremost ruler, for the project of placing Russia at the head of all power generating countries of the world, have procured him an exceptional position.

The rest of the foreign engineers, however, have to fight heavily for privileges not nearly approaching those demanded by Colonel Cooper. In this connection, a word of warning is necessary: they should in no case depend on promises of the Soviet functionaries, but should insist on having things clearly settled in writing on their contracts before going to Russia.

In general, the contracts between foreign engineers and Soviet Russian trusts or economic combines are fixed by the representatives of the respective combine or trust in the foreign country, or by a trade representative, such as Amtorg, in the United States. These contracts

are then confirmed by the Supreme Economic Council. In view of later claims and eventual legal disputes, this latter confirmation should in no case be renounced. If the engineer is not familiar with the Russian language, he should insist on receiving a certified translation. In no case are oral promises or arrangements to be accepted. Foreign trade representatives of the Soviets are justly regarded as the most cunning agents in existence. Those authorized to engage foreign technicians operate on a "super-capitalistic" basis and in the meanest way take advantage of the present worldwide economic depression. Because of the overwhelming number of applications received, they feel that they may pay for qualified technical ability with the scantiest of rewards.

When fixing a salary, the increasing depreciation of Russian money, and of course the very nature and extent of the task intended for the expert, must be taken into account. Part of the salary should be remitted abroad in dollars direct to the bank account of the engineer. It is advisable to ask for a small part of the salary in Soviet Rusian currency, that is, only as much as is required for subsistence. Before leaving for Russia, it is also necessary to settle in the contract the question of taxation. Otherwise, more than 10 per cent of the income is often collected. In many cases it has been successfully effected in preceding negotiations that no taxes need by paid on salary at all. In any case one should endeavor to let only the sum to be received in Soviet rubles appear in the contract as liable to taxation.

By observing all these precautions and with the assurance of a decent salary (the average salary of an academically trained American engineer engaged in Russia amounts from $12,000 to $20,000 per year) a position in the Soviet Union offers certain advantages. In the first place, this is the time for foreigners to make a decisive influence on the development of the Soviet Union, and in this connection, on the future marketing possibilities of American products in Russia. Once American engineers manage to acquire the esteem of the Russians or, better still, to sustain the respect of the slow Russian engineers for American enterprise, then it is merely a question of time until those Russian engineers educated at German universities and heretofore swearing by German workmanship become more amenable to American methods.

Sharpening Reamers—*Discussion*

BY W. HORSEFIELD
Manchester, England

I QUITE agree with L. M. Richards (*AM*—Vol. 75, page 177) when he says that difficulties in sharpening cause 90 per cent of reamer troubles. To overcome these difficulties, the human element should be eliminated, and the reamers ground on an automatic reamer sharpener similar to the Barber-Colman.

The operator need not be highly skilled to sharpen reamers to limits of 0.0001 in. on diameter and to limits of 0.001 in. in the amount of clearance on the cutting edge. The reamer, when sharpened on this machine requires no touching up with a stone, and every blade is sharpened to the same diameter so it cuts uniformly.

The form of nose, back taper, diameter, and cutting clearance are all under mechanical control throughout the sharpening, which makes exact duplication an easy process; also there is a saving in reamer costs, reaming costs, and sharpening costs.

Rubber-Tired Railcars

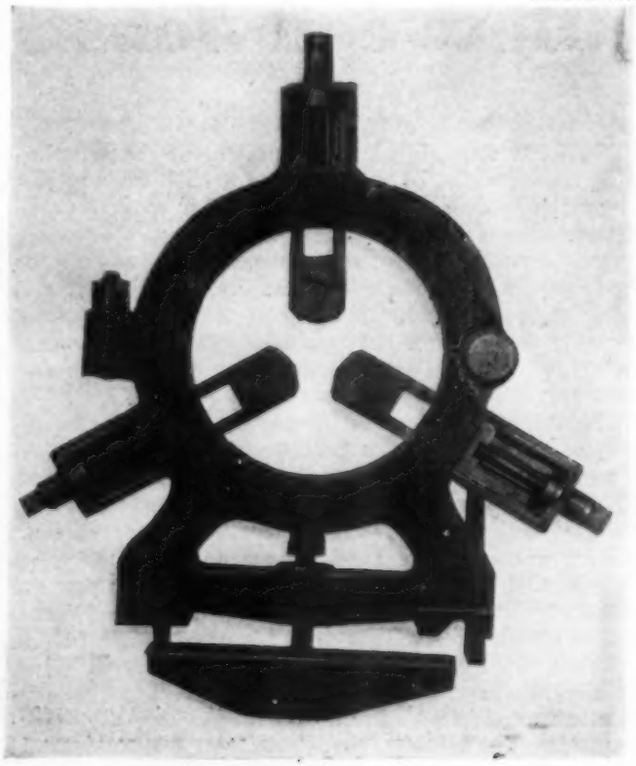
Shops making wheels for railway use may well sit up and take notice when they learn of the successful application of pneumatic rubber tires on railcars produced in France. Reports indicate that Michelin, France's largest tire maker, has perfected tires for this purpose and that they have been adopted for 24-passenger railcars propelled by gasoline engines. These cars are not unlike the buses modified to run on the rails of branch line railroads in this country, except that they have five axles, three forward and two in the rear.

There are, of course, ten wheels, each fitted with 33x4-in. standard straight-side rims and tires inflated to 85 lb. per sq.in. pressure. The wheels are demountable and are changed in the same way as automobile wheels. A wooden ring inside the tire prevents the wheel from falling more than $\frac{5}{16}$ in. in the event that a tire is deflated. Tires are said to be good for an average life of 22,000 miles, and speeds as high as 80 miles an hour have been made by cars equipped with them. A standard railway flange is bolted to the wheels, and a deflated tire is said to make no appreciable difference in riding of the vehicle. The latter can climb a 10 per cent gradient as against a maximum of 4 per cent with steel wheels. Brakes are of the Lockheed hydraulic type, similar to those used on buses and trucks.

An All Arc-Welded Steadyrest

Strong, yet light, this all-welded steadyrest weighs but 45 lb., according to J. F. Dillon of Cottage Grove, Ore., who built it. Contrast this with a weight of 100 lb. or more for a cast-iron rest of the same capacity. The outside shell is of $\frac{1}{4}$-in. plate; the guides are annular rollers. Capacity is 8 in. diameter

Lincoln Electric



Central control board with operation card rack as installed at Boston Gear Works

Eliminating Lost Motion Between Jobs

KEEPING machines at work is one of the most important duties of shop management. Knowing just how machine time is divided is essential in getting a true picture of costs. Shop time cards are not always accurate, because both men and foremen dislike to be bothered with paper work. Timekeepers, job chasers and stock chasers all add to the cost of doing business, not only as to wages but because of delays that almost inevitably occur in accumulating shop information and putting it into usable shape.

There have been several attempts to eliminate by recording mechanisms the necessity for time cards and chasers of various kinds, but none has been widely used. The Temporator, an intercommunicating control system built by the Temporator Company, Chicago, is, however, making its way into a number of industries. The illustrations show its application to machine shops in the plants of the Boston Gear Works, Norfolk Downs, Mass., and the Bell & Howell Company, Chicago, Ill.

Briefly the system consists of a central control board, usually in the production department. Substation dispatchers are located conveniently throughout the working areas. In addition there is an audible and visible annunciator system to control indirect labor, such as truckers, inspectors, counters, set-up men and foremen. The entire system is a multiple-signal layout affording intercommunication between several employes simultaneously. The entire plant is under the control of the central board operator, who, in the cases cited here, accumulates all shop records for a force of seven or eight hundred men. Speed in handling reports is essential, and where there is need for great volume of transmission of information, service dials of the general automatic telephone type are installed within arm's reach of the worker, so that in a few seconds he can communicate with the central operator. In actual use this is not necessary as often as might be imagined.

The fallibility of the human voice is avoided by the use of predetermined symbols, usually letters and numbers. All time cards are at the central control board where all timekeeping records are made. The individual workers or group leaders report their starts and finishes, blocks and delays, piece counts, etc., by dialing their station numbers, machine numbers, job numbers, etc., to the central control operator who timestamps all reports. These records are then immediately available for the cost records. When they check out old jobs the workers check in on the new, in this way eliminating lost time between job changes. Every minute of a man's time along with that of his machine is accounted for. Progress

Service man's call station

Heat-treat man reporting. Bell & Howell Company

A station in the turret lathe department

records can then be set up, timely and accurate, thus furnishing the planning or production department with usable load information.

Every report is checked and errors can not be made without being immediately corrected. The paper work is thus eliminated from the shop and there is no longer need for the expensive shop force of clerks. The office routine is simplified through continuous handling of shop information rather than the usual periodic accumulation of work. With timely scheduling, job chasing is no longer needed, and accurate machine time is possible. The system keeps tabs on the performance of every machine and furnishes a record of "down time" on each unit at once. In shops where standards are established, absolute control on running performance is possible for the production department.

Applications in the heat-treating and turret-lathe departments are shown in the illustrations. Assembly and benchwork also are reported by this system. The psychology of having shop workers report continuously throughout the day, directly to headquarters, makes for rigid control. Herein lies an indirect but most certain economy in management.

Carbide Tips for Milling Cutters

T. H. ABNEY

The introduction of inserted blade cutters a number of years ago probably did more toward broadening the field of milling than any other previous development in cutter design. Inserted blade cutters have been largely responsible for the heavier cuts and faster cutting speeds used in production milling today. And now, since the introduction of tungsten- and tantalum-carbide tips for the blades, they are gaining new favor. Cutting speeds and feeds, previously unheard of, are now practical.

Economy is another big factor gained by the use of these cutters, since the teeth comprise a number of individual blades. When a set of blades has worn out, a new set can be inserted and the body used over and over again.

Another economy lies in the ease and low cost of repairs. This is especially true when the blades are tipped with either tungsten- or tantalum-carbide. Should a blade break because of overstrain or an accident, it is necessary to replace the blade only; where otherwise, it might mean an entire new cutter. In some cases, the accident may not break the entire tooth of a solid cutter, it may just break the tip. Before that cutter can be used again for accurate work, every tooth in the cutter must be ground to match the one chipped. This grinding process takes time and is expensive. With an inserted blade cutter, the chipped blade can be set out a little further in the body, and the one tip ground to match the rest.

The uses of inserted blade face milling cutters are becoming broader and more popular every day. Face milling has proven practical and economical on work that requires more than the usual amount of accuracy, since there are but two major factors entering into the cut—the machine and the cutter. Thus the chances of misalignment are greatly reduced.

In any form of milling, the essentials for accurate work are a rigid machine in good operating condition, sturdy holding fixtures, and good cutters.

Precision Measuring Instruments

OLIVER P. VAN STEEWEN
Berlin, Wilmersdorf, Germany

Germany's progress in instruments for accurate and rapid inspection has been remarkable. The more outstanding of these instruments are being described in a series of articles of which this is the second

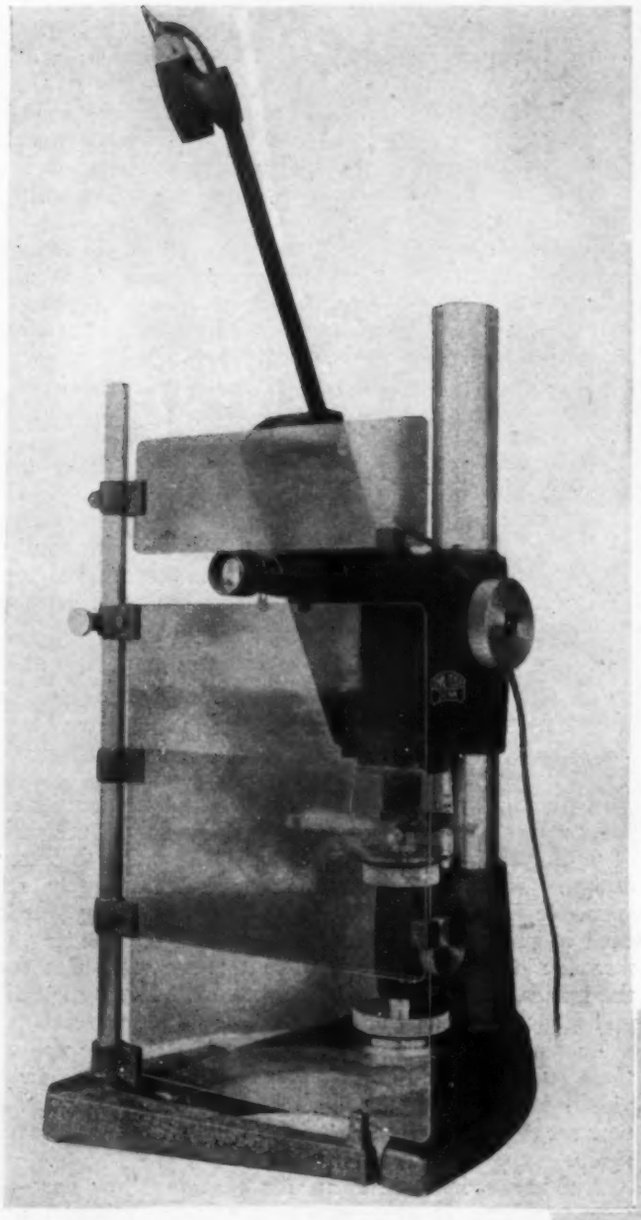


Fig. 12—The Ultraoptimeter is so sensitive that it must be shielded from the body heat of the observer

Fig. 13—Saddle-gage for checking rolls for camber, or while grinding

THE Ultraoptimeter, Fig. 12, is chiefly used for testing precision gage blocks, plug gages, etc. The working principle of the instrument is as follows: The image of an illuminated graduated plate is twice projected on a tilting mirror and twice reflected by it. One edge of the tilting mirror rests on the measuring pin, and the agate tip of the latter touches the surface of the object under test, which, in turn, is supported by a table adjustable for height. Deviation of the object from the supposed measure causes a movement of the measuring pin, thus tilting the mirror. As the mirror is tilted (of course this is only an ex-

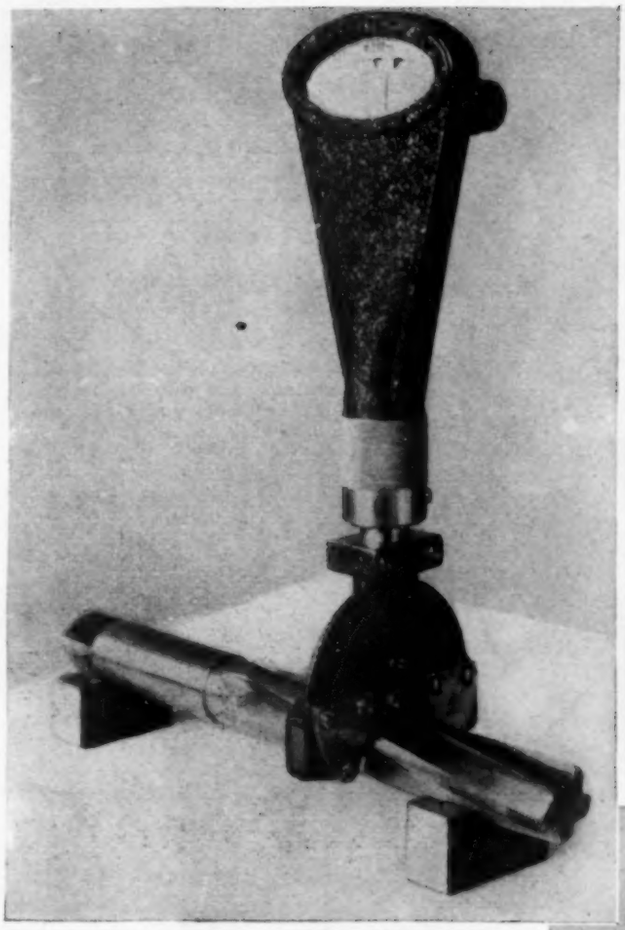


Fig. 14—Mikrotast saddle-gage for small objects such as fluted reamers, and taps

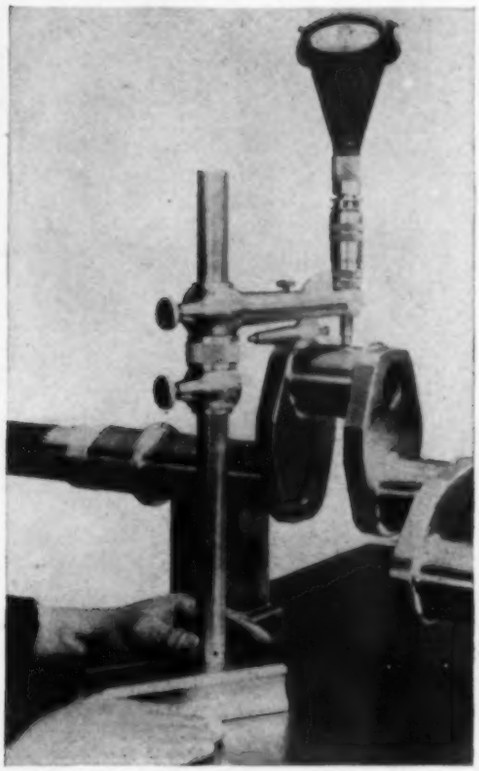


Fig. 16—Mikrotast double point height gage with hinged arm for measuring throw of crankshafts

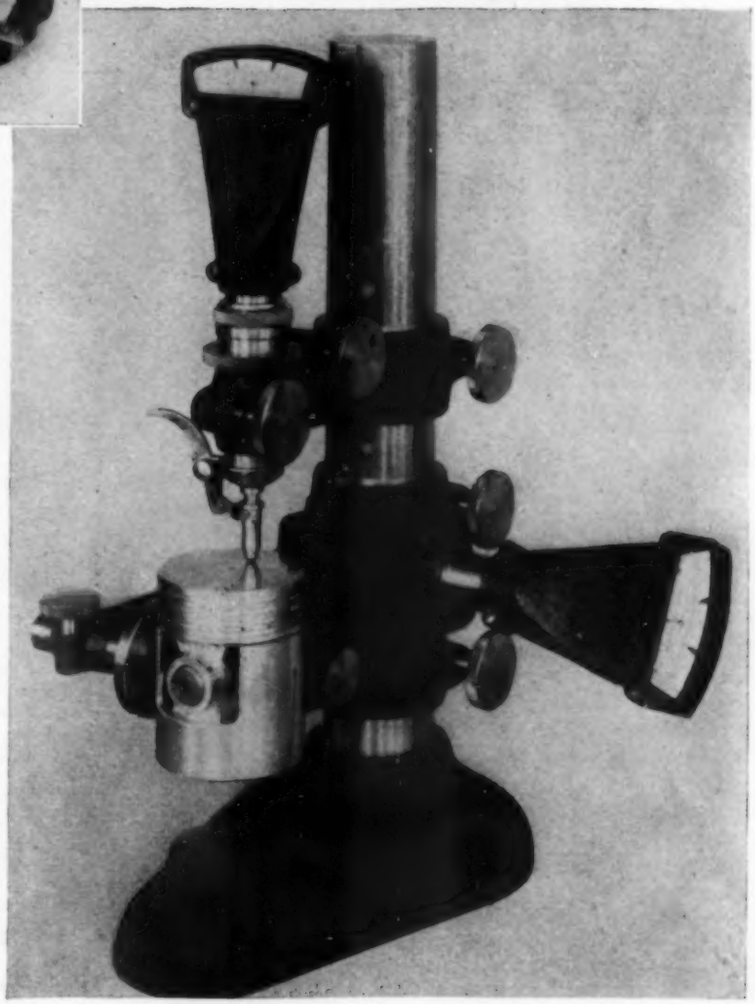


Fig. 15—Combination height and diameter gage for pistons

ceedingly small angle) the scale image reflected by it appears in a changed position compared to the fixed index in the visual field of the eye-piece. Because of the extreme sensitivity of the instrument, the warmth radiated by the body of the observer must be effectively shielded. This is accomplished by means of a temperature-protecting device, consisting essentially of 3 Robon glass panes held in place by a stand. Robon glass acts as a filter for heat rays.

As previously mentioned, for checking diameters of cylindrical work during the manufacturing process, the so-called saddle- or straddle-gages made by Krupp and Fortuna Werke are widely used in Germany.

In Fig. 13 is shown a saddle-gage for gaging work during spherical, hollow or cylindrical grinding operations. It is also used for checking camber and wear of rolls. The measuring angle of this instrument is 90 deg. Fig. 14 shows a Mikrotast saddle-gage with 36-deg. angle for checking the lands of a spiral reamer with five flutes. Other applications of the Mikrotast are shown in Figs. 15 to 20.

For several years special attention has

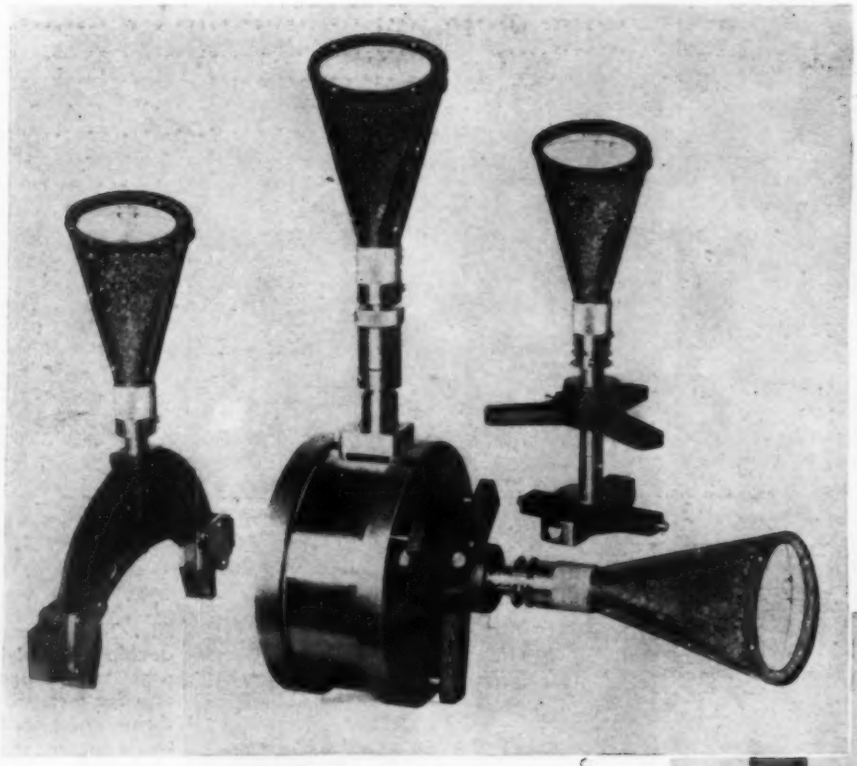


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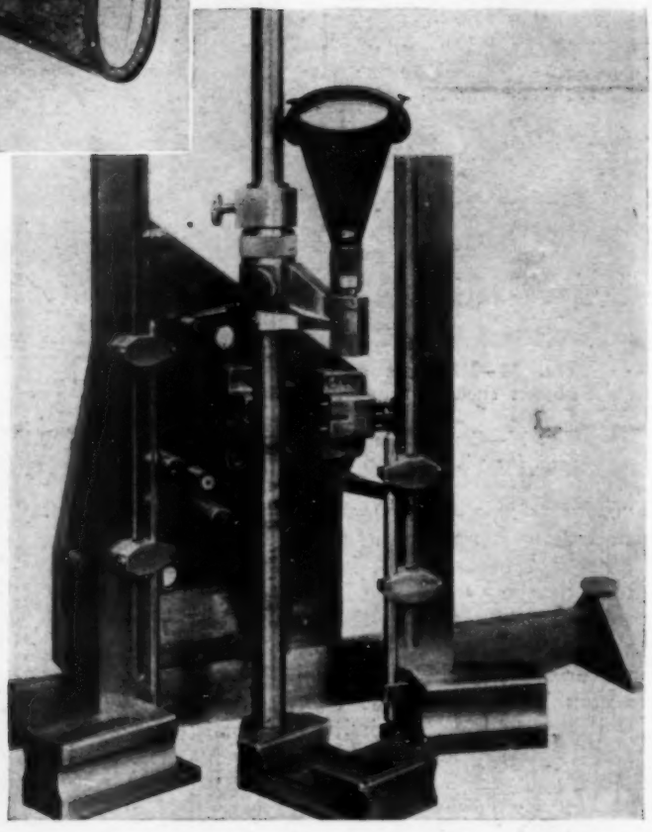
Fig. 17—Miscellaneous internal and external with Mikrotast application

Below

Fig. 19—Height gage for checking jigs and fixtures. The two square-like stands carry measuring rods for comparison purposes



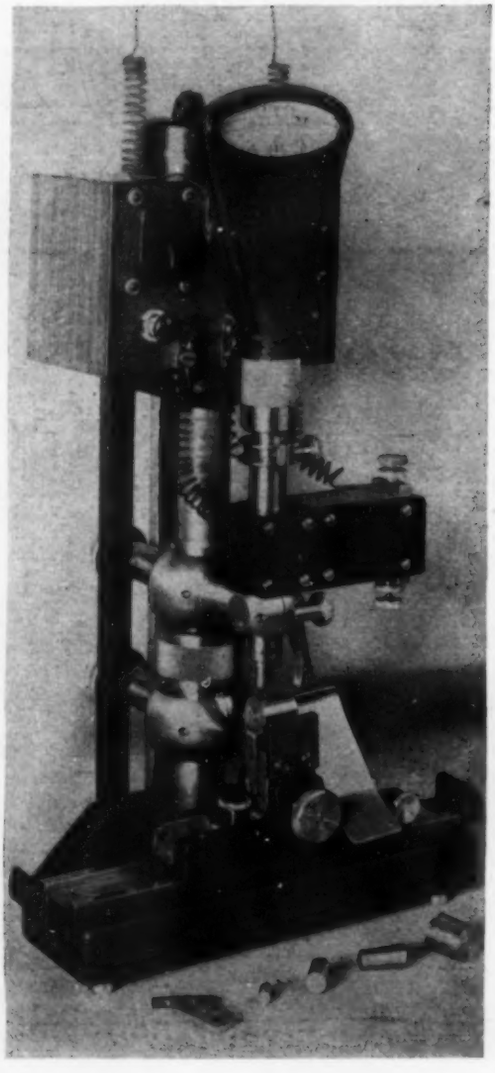
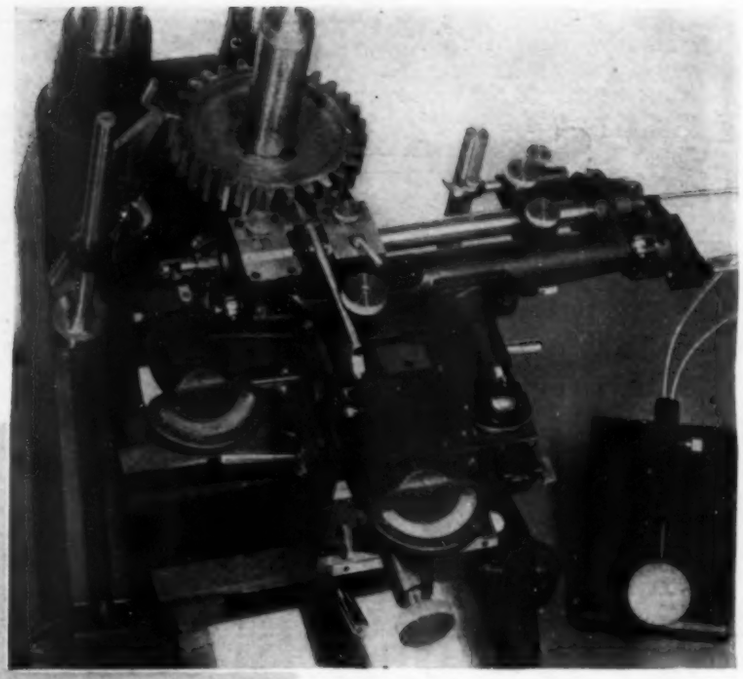


Fig. 18—Device for checking the taper on pins or rollers. An electric light is flashed when the measurement limits are outside the tolerance

been given the testing of gears. The gear testing instrument made by Zeiss, Figs. 21 and 22, can be used for spur, bevel and spiral gears. It serves for measuring base circle pitch, eccentricity of gear, uniform space and uniform breadth of teeth. With this instrument, comparative rather than absolute measurements are made. Therefore, the circular pitch of the root line is computed and subsequently multiplied by the cosine of the angular contact. Then the distance between the measuring jaws is adjusted to the value thus obtained

Below
Fig. 20 — Gage for motor and plates or similar articles

Right
Fig. 21—Gear testing device made by Zeiss. This is a universal instrument



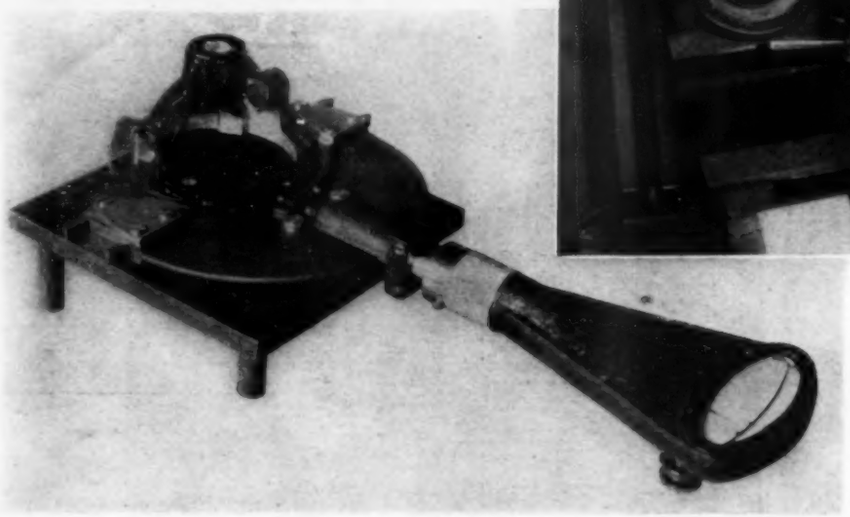
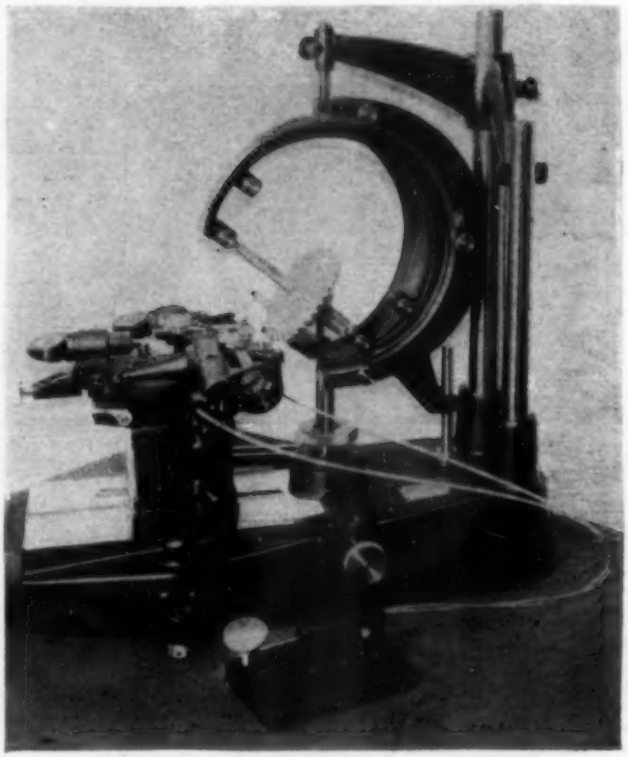


Fig. 22—Fixture for testing bevel gears, in place on the Zeiss gear tester



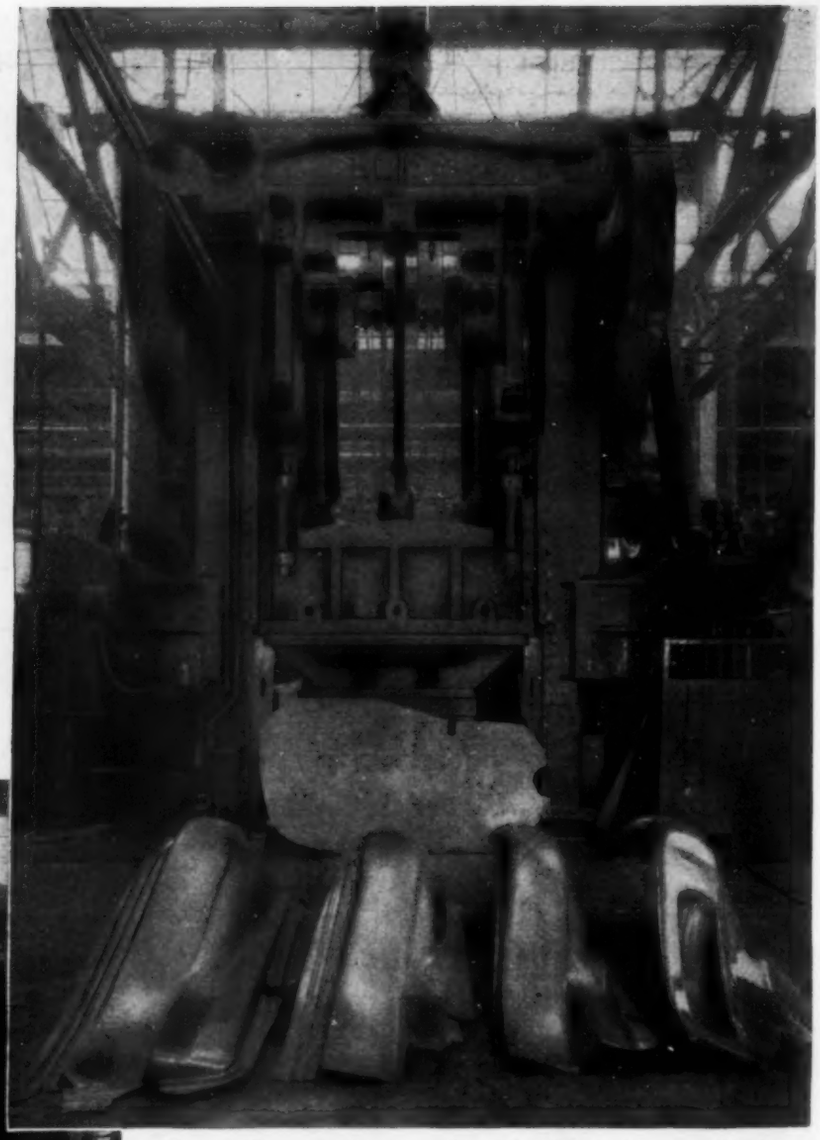
by means of precision gage blocks. The measuring itself merely consists of placing the measuring jaws against corresponding flank faces of neighboring teeth. Deviations from the supposed dimension are transferred to a dial indicator by means of a lever system and can be read with an accuracy of 0.002 min., i.e. closer than 0.00008 in. The radial throw is derived from the depths of penetration of a radially movable, spherical-pointed measuring pin into the spacings. Readings are taken from a second dial indicator with the same degree of accuracy. Upon plotting these measurements in a diagram, the uniformity of tooth space can easily be separated by computation from the radial throw. The uniformity of tooth breadth is measured at opposite flank faces by means of measuring jaws fitted with spherical points.

A simple instrument for determining tooth breadth and depth is also made by Zeiss. Measurements by this instrument are based on the presumption that both the dedendum circle and the addendum circle are concentric to the axis of the gear. Beside other features, this design makes use of springs to avoid lost motion. Deviations as small as 0.02 mm. or approximately 0.0008 in., can be read, and even smaller values can be easily estimated.

This is the second of three articles. The last will appear in the forthcoming number.

Some Lincoln Methods

J. B. NEALEY
American Gas Association



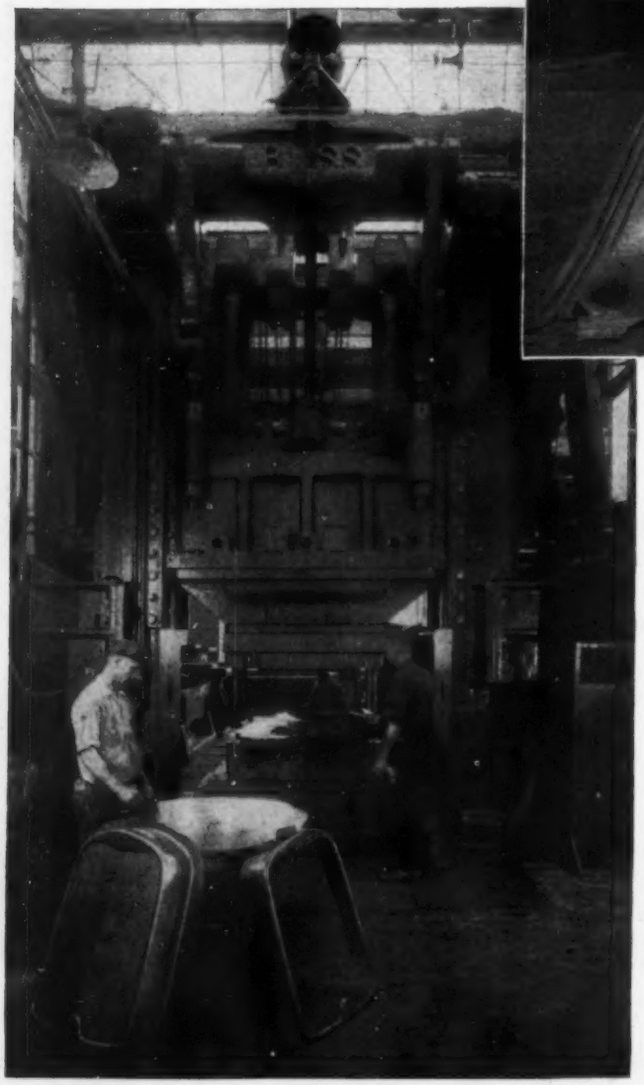


Fig. 1—Rear fenders are formed cold in three operations; front fenders require five, while radiator shells (Fig. 2, left) require nine

WHILE the body of the Lincoln car is made entirely of aluminum, there are more than 1,300 jobs performed in the pressed steel division of that plant. Here are to be seen a number of large power presses, some of them taking dies weighing many tons per set. Centrally located is a long die-storage stand of 20-in. I-beams on 4-ft. centers and of the same height as the bolster plates in the presses. This stand is used for the heavier dies. An overhead monorail system is used to transfer the dies to and from the larger presses, which also are provided with individual hoists for placing and removing the dies.

Fenders are formed from cold-rolled 18-gage sheet steel that has been normalized in gas-fired furnaces to give it deep-drawing qualities. The rear fenders, right and left, are stamped cold in three operations on three presses. The first draw, on a 410 Bliss press, gives the steel a double contour. The second rolls the edge in a Niagara roll, and the third flanges, beads and trims in a 10E Bliss (120 ton) with a compound die.

The front fenders are made in five operations:

1. Notch edges in small Bliss press.
2. Form reverse radius in press with upper die of cast

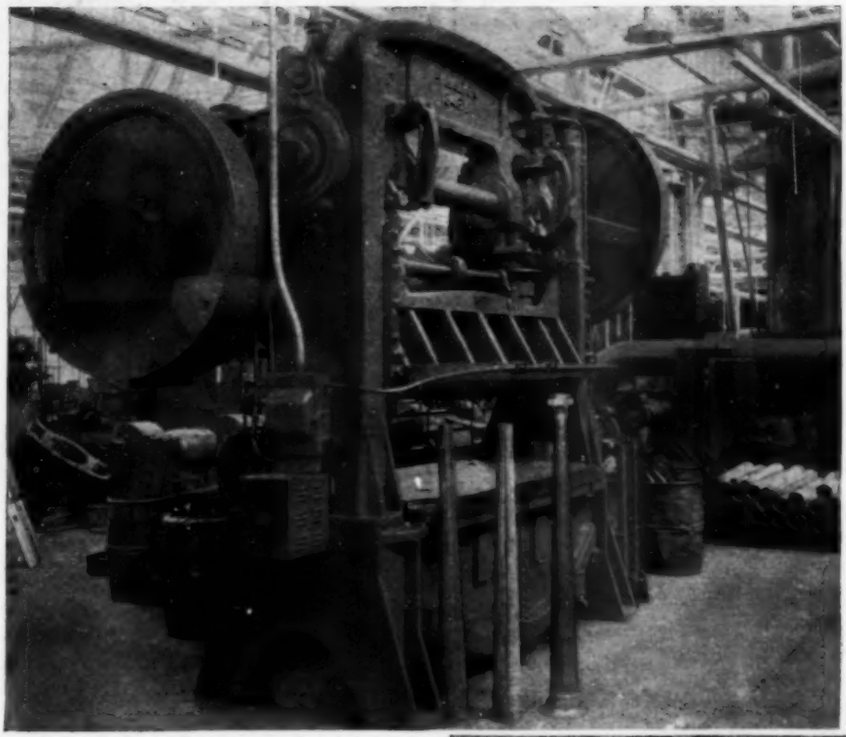


Fig. 3—The machines necessary to make a torque tube are grouped. The flanges are drilled before welding and the tube is completely finished with a minimum of movement

iron and a rubber cushion taking the place of the lower. The upper die is the exact contour of the fender and when the press is tripped the rubber cushion forces the sheet up into the metal die. Besides eliminating one die this arrangement gives a better job.

3. Draw between male and female dies in 410E Bliss.
4. Shear edges between disk cutters (rotary shear).
5. Trim flange and bead in 410E Bliss.

The fender apron is made as follows:

1. Rotary shear to templet.
2. First form by hand.
3. Form in Bliss 407.
4. Heat corners with gas torch and spread with hand hammer.
5. Trim in Toledo 206E.

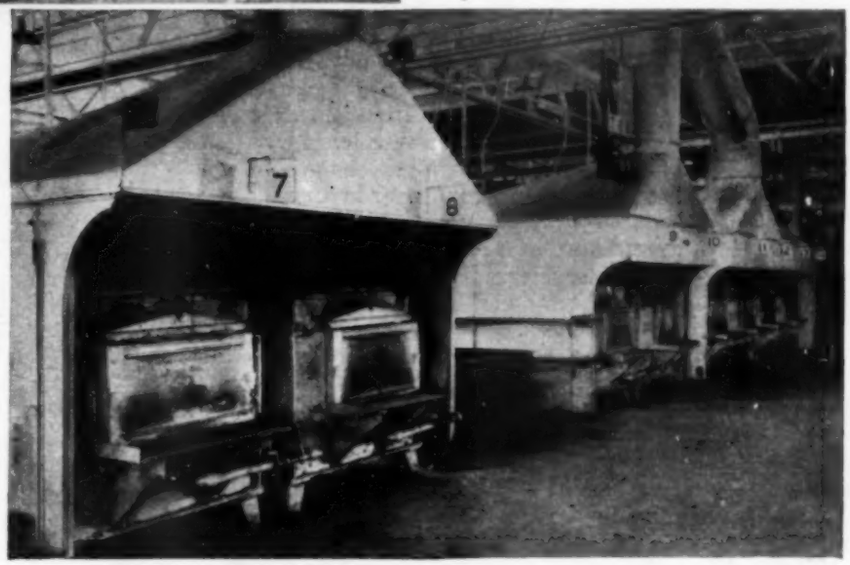
The radiator shell is made of the same stock as the fenders, apron, etc., there being nine operations.

1. Rotary shear to templet.
2. Draw in Bliss 410E.
3. Restrike in Bliss 407.
4. Perforate two center holes for press cams.
5. Expand shoulder for head to set into. Bliss 410E used with male and female dies with cams that slide laterally to form the shoulder. Punch and die operate in holes cut in previous operation.
6. Form water spout in PA-5 Bliss with a single die and punch which perforates and forms.
7. Notch two lower corners in PA-5 Bliss.
8. Trim center of lower wall in PA-5 Bliss.
9. Perforate lace holes on shoulder in 93½D Toledo.

The torque tube that houses the drive shaft between the transmission and the rear axle is of low-carbon, open-hearth 11-gage sheet steel, that has been normalized in a gas-fired furnace to give it deep-drawing qualities. This tube is somewhat larger at one end than the other, and a flange is butt welded onto either end. The tube is formed cold in a Hamilton 846½ equipped with a three-impression die. The edges are nipped in the first die to start it, the blank is formed to U shape in the second, and the tube is closed in the third.

Another die is placed in the press and the tube restruck to make it perfectly round. The seam is then welded in an automatic welder and the flash milled in a Lincoln miller. The tube is then put into a straightening machine which straightens it and rounds out the edges at the same time.

Fig. 4—Part of the battery of gas-fired furnaces used for heating operations



The flanges are then butt welded on. The flange for the smaller end comes as a forging.

The larger flange is a pressed-steel stamping from 5/16-in. stock, and is made as follows:

1. Blank in Hamilton press.
2. First form in 407 Bliss.
3. Annealed in gas-fired furnaces.
4. Second form in 407 Bliss.
5. Third form in 3611½ Hamilton.
6. Pierce holes in 3611½ Hamilton.
7. Trim in 3611½ Hamilton.
8. Restrike in 3611½ Hamilton.
9. Face bottom and bore to inside diameter in Warner & Swasey 6.
10. Face and turn to outside diameter to form radius and cut to length in W. & S. with two tools.
11. Drill 8 holes in Baker, single-spindle multiple-head drill press.

12. Countersink 8 holes in Leland & Gifford.
13. Drill oil holes in Leland & Gifford.
14. Tap oil holes in Garvin drill press.
15. Butt weld onto torque tube.

Another division of this plant is devoted to the forming and assembly of the aluminum body parts. Nearly all of this is accomplished by hand on wooden forms and the parts are welded together with torches using gas and oxygen.

The gas furnaces in which the various items produced in this department are annealed are of brick, steel encased, and about 8 ft. long, 6 ft. wide and 4 ft. high. They are under-fired with a gas burner at each end, the hot products of combustion rising up around the sides of the hearths and behind baffles of refractory material, into the heating chamber. With the use of inspirators any furnace atmosphere, reducing, oxidizing, or neutral can be maintained. In annealing, a reducing atmosphere is vital.

Temperatures are maintained automatically with temperature controllers connected to thermo-couples within the furnace on one end and to motor operated valves on gas supply lines at the other. Recorders are also a part of this equipment.

NEW BOOKS . . . . . .

THE PSYCHOLOGY OF THE INVENTOR—*By Joseph Rossman, Patent Examiner, U. S. Patent Office. 352 pages, 5⅜x8⅜ in. Indexed. Clothboard binding. Published by the Inventor's Publishing Co., 1266 New Hampshire Ave., Washington, D. C. Price $3.00.*

Our comforts and our recreation, our machines and our processes—indeed, almost the entire fabric of this present civilization is due to the inventor. Individual geniuses fire public imagination; our Edisons and our Fords are paid homage. But by and large, inventors as a group receive scant attention and less assistance.

Who does the inventing? Why does he attempt it? How does he approach his task? What obstacles does he meet? These and many other questions, pertinent to the workings of the inventive mind, are explored by Dr. Rossman. The author traces a change in technique from the methods of the "Yankee inventor," poor in knowledge of his subject but rich in native resourcefulness, to the more systematic procedure of the modern industrial inventor, employed by a large corporation, who may be so imbued with what has been done that he lacks the fresh vision to conceive basic ideas.

Dr. Rossman's material is drawn from his own Patent Office experience and from data supplied by 710 prominent inventors. He analyzes the characteristics of the inventor and the steps taken in arriving at that "leap of the imagination" that captures a new concept. Chance and accident play a part in this process, but these would avail little were not the observer capable of profiting by the recurrence of certain phenomena.

The author makes several suggestions to help the inventor and increase his value to the rest of humanity. Our present educational formulas too often stifle rather than stimulate inherent ability. Dr. Rossman suggests that special training to develop inventive ability be substituted. Another suggestion is for a special advisory committee to avoid needless duplication of effort and the following of false leads which result in a tremendous waste of energy and money. These pitfalls are made more insidious by the activities of unscrupulous attorneys who encourage the securing of worthless patents. Still another plea is for a special court of patent appeals to standardize practice in cases of validity, interference, and infringement. Such a court would become familiar with patent procedure and eliminate such of the delay and detailed testimony necessary to enable our regular courts to make intelligent decisions.

The courts recognize that the act of inventing is a specific mental process. Thus a study of the inventive mind is of legal as well as educational interest.

ONWARD INDUSTRY!—*By James D. Mooney, vice president, General Motors Corp., and Alan C. Reiley, formerly advertising manager, Remington Typewriter Co. 564 pages, 6x9⅛ in. Indexed. Clothboard covers. Published by Harper & Brothers, 49 East 33rd St., New York, N. Y. Price $6.00.*

Few books come more highly recommended than this thoughtful volume, it having been read in the proofs by such men as Malcolm C. Rorty, vice president, American Founders Corp., Dr. Hjalmar Schacht, president of the Reichsbank, Dr. Harlow S. Person, director, The Taylor Society, Charles J. Bartlett, managing director, Vauxhall Motors, Ltd. They are unanimous in their approval.

The subtitle—"The Principles of Organization and Their Significance to Modern Industry"—explains its content far more clearly than its title. It is an affirmative answer to one pertinent question, "Does the history and theory of organization as applied for generations in the Army, the Church, the State, throw light on sound organization methods for industry?" It studies the setups of various armies, churches and states, ancient and contemporary; it establishes principles applicable to any plant or office; it concludes with a memorable chapter, "The Present Challenge to Industrial Leadership."

REPORT OF STRUCTURAL STEEL WELDING COMMITTEE OF THE AMERICAN WELDING SOCIETY—*208 pages, 6x8 in. Paper covers. Indexed and cross-referenced. 54 cuts and 18 tables. Published by the American Welding Society, 33 West 39th St., New York, N. Y. Price $1.00.*

Organized in 1926 for the purpose of "obtaining reliable information upon which to base safe unit working stresses in the designing of welded structures," this committee found it necessary to gather data from an exhaustive series of tests previous to its report. The final program included testing of about 1,100 welds in connection with the qualification of welders and 1,400 in connection with the investigation proper. Final conclusions of the committee are that the permissible unit stresses specified in the A.W.S. Code are safe and reasonable under proper conditions, and that a welded joint in commercial practice may be expected to have a strength within 12 per cent of a general average for that type of joint, providing the welder has attained the stated qualifications. This is an exhaustively complete progress report presenting data of interest to every structural welder.

Ideas from PRACTICAL MEN

Cutting Multiple Threads—*Discussion*

GEORGE ODUM

I have followed with keen interest the various articles commenting on the method of cutting multiple threads described by Charles Kugler (*AM*—Vol. 74, page 618). With a few changes, I use the method given on pages 6 and 7 of the third edition of the *American Machinists' Handbook*. However, instead of stopping the lathe, disengaging the lead screw nut and moving the carriage a distance (by measurement) equal to the pitch of the threads to be cut, and then re-engaging the lead screw nut, I allow the lathe to run continuously, which I think saves considerable time.

A plan view of a set-up for cutting triple threads is shown in Fig. 1. The spacing is obtained by the two square, cold-rolled blocks *A* set against a stop clamped to the lathe bed. The thickness of the blocks is equal to the pitch of the threads to be cut. With the lead screw and the nut engaged, the carriage is traversed by running the lathe backward until the tool is about an inch beyond the starting point of the cut. The stop is then moved until the blocks are in contact with the carriage, at which time the adjacent marks *X* are made on the driving plate and the lathe bed. Setting the tool for depth of cut, the first cut of the first thread is made, and the first block is removed.

The lead screw nut is then disengaged without stopping the lathe and the carriage is moved until it contacts with the second block. With the marks *X* in line, the first cut of the second thread is made. The operation is repeated for the first cut of the third thread, removing the second block and running the carriage against the stop. For the second cut on the first thread, both blocks are put back against the stop. The cycle of operations is repeated for the succeeding cuts on each thread. By using the multiple tools shown at *B* and *C* the threading time can be reduced to about the time required to cut a single thread. Such tools can be used for cutting either external or internal multiple threads without the spacing blocks. However, should there be an error in spacing the tools in the holder, the error will be transferred to the work.

If the screw being cut is a long one, collars of the same diameter as that of the root of the thread should be placed on the work, as at *D* and *E*, one to set the tool for the final depth of cut, and the other to check the wear of the tool, or the amount it has sprung away from the cut. The finishing cut should scrape both collars.

When the pitch of the lead screw is such that certain multiple threads cannot be spaced by the method outlined above, the spacing can be done by the compound rest. Suppose, for instance, that multiple threads having a pitch of $\frac{1}{4}$ in. are to be cut and that the pitch of the compound-rest screw is six, no micrometer collar being provided. Setting the compound rest at an angle of 30 deg. to the center line of the cross-slide and giving the screw three full turns will move the tool $\frac{1}{4}$ in. along the axis of the work. To check the accuracy of the screw and the angular setting of the compound rest, proceed as follows:

Chuck a short piece of round stock, as at *B* Fig. 2, and face it truly. Take a piece of square, cold-rolled steel *A*, center drill and countersink it at one end

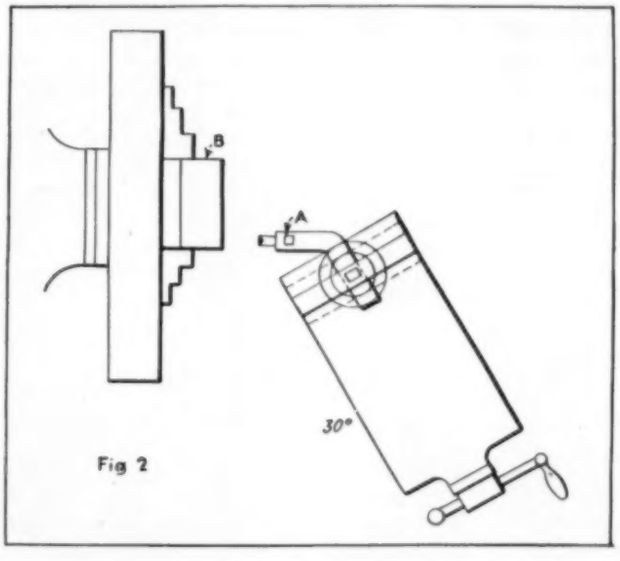


Fig 2

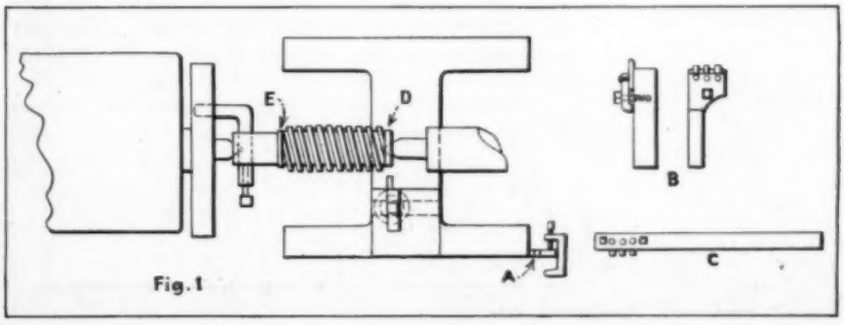


Fig. 1

so that when one end of an inside micrometer is placed against it it will rest in the countersink. Bend the piece to an angle of about 30 deg. and clamp it in the toolpost as shown in the above illustration. Move the carriage so that the bent end is within miking distance of the piece in the chuck. Apply the micrometer and take a reading. Give the compound-rest screw three full turns and again apply the micrometer and

take a careful reading. Give the compound-rest screw three full turns and again apply the micrometer and take another reading. If the piece in the toolpost has not moved exactly $\frac{1}{4}$ in. nearer the piece in the chuck, change the angle of the compound rest until the exact movement is obtained when the screw is given three full turns.

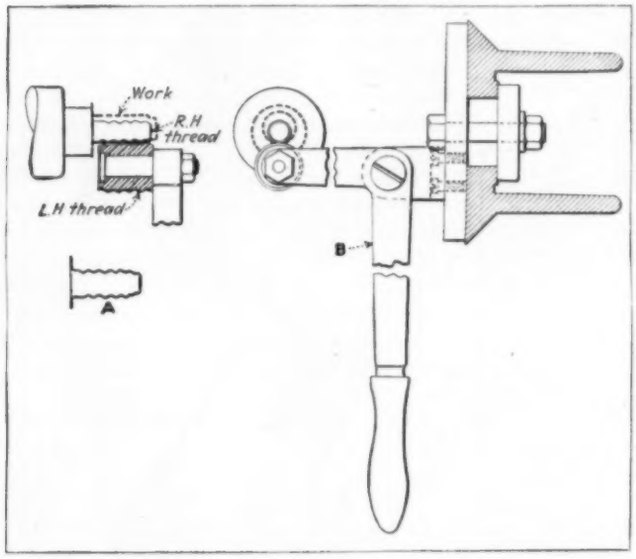
If a spacing of $\frac{1}{8}$ in. is required, set the compound rest at 14 deg. 29 min. ($14\frac{1}{2}$ deg. is close enough) and give the screw three full turns. By checking the advance of the piece in the toolpost by the inside micrometer, as before, the angle of the compound rest can be changed until the exact movement of $\frac{1}{8}$ in. is obtained.

A Thread-Rolling Attachment

HENRY W. BOEHLY

A quantity of small flanged shells, such as the one shown at *A*, were required to be threaded by rolling. The problem was to devise some inexpensive tool or attachment that would do the work, since the job was experimental to a certain extent. After giving the matter considerable thought, I designed the attachment illustrated.

An arbor having the outer end threaded to the form and pitch of the thread required, but smaller in diameter



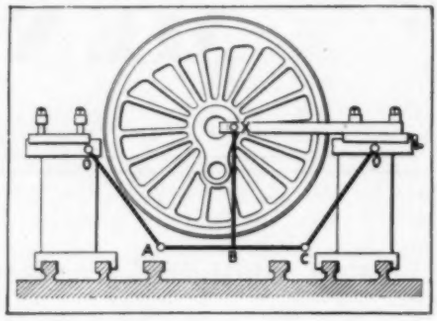
than that of the shells, was fitted to the spindle of the lathe, the threaded end being hardened. The lever *B* is pivoted to a bracket mounted on the lathe bed. A stud in one end of the lever carries a hardened roller having a thread of the opposite hand to that on the arbor. The mounting of the lever is such as to permit it to have enough free motion sidewise to allow the threads on the roller to mesh properly with those on the arbor.

In operation, a shell is placed on the threaded end of the arbor, with the flange against the shoulder, and the lever *B* is raised to bring the threaded roller in contact with the shell. Pressure is applied to the lever for about three revolutions of the shell, and the thread is rolled without difficulty. Since the diameter of the shell is greater than that of the threaded end of the arbor, the finished shell can easily be slipped off by the fingers and another one put in its place without stopping the lathe.

A Tool-Bar Support

D. Q. DUNSTONE
Hetton-le-Hole, England

Recently, we found it necessary to face the ends of locomotive axles in a wheel lathe having two driving plates. It was considered undesirable to remove the wheels from the axles. The wheels were driven at one end of the lathe and the facing was done at the opposite end. The tool rests were of the pillar type and were situated at opposite sides of the work. It was, of course, necessary to use a long tool bar to reach the axles, and because of the short surfaces of the tool slide, considerable vibration was set up. Although extreme accuracy was not asked for, the vibration made it impossible to do a good job.

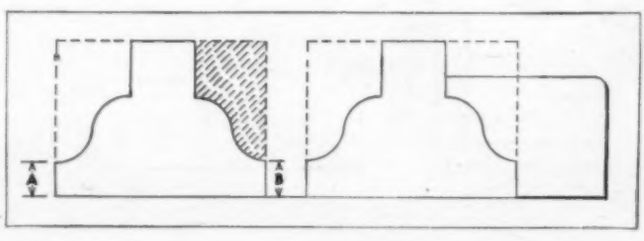


It was impracticable to support the cutting end of the tool bar by a post, as there was no movement of surfaces directly below. A four-bar mechanism (shown in the sketch) was hinged to the two toolposts at *O* and *O* and to the tool bar at *X*. The travel of the point *X* was found to be close to a straight line when the mechanism possessed the following features: $OA = XB = OC$; $AB = BC$; the angles *ABX* and *CBX* = 90 deg.; the rod *ABC* is parallel with the travel of the tool when the tool is at the center of its travel; and the angles *OAB* and *OCB* are equal. The five fulcrum pins are all light tap-in fits in the links. By the use of this device, the vibration was reduced sufficiently for the axle ends to be faced satisfactorily.

Contour Machining in the Shaper
Discussion

J. T. TOWLSON
London, England

The article by Daniel I. Krauss, under the title given above (*AM*—Vol. 75, page 28), gives expression to his idea of the best way to transfer the form of a particular contour to the work. With all due respect to Mr. Krauss, it is without hesitation that I contend that the method suggested by him is not the most approved one, and not the one that could be adopted with favor in any shop where contour work on the shaper is well understood. The reason is this: because there is a way that is generally adopted where such work is done,



whether it be done by planing, shaping, slotting, or turning.

Finishing a contour to lines is, to my mind, of all things objectionable. Roughing out to lines is all right, and is therefore allowable. But just to make a finishing templet, mark off the work from it and work out the contour with only the line for the guide, cannot be admissible as good work. It is reasonably assumed that the heights *A* and *B* in the illustration are the same. The templet is laid on the work with its square sides fair with the edges. A scriber is used to mark a line around the contour of the templet. Since this line must necessarily be several thousandths from the templet, it will be too low, and if the shaping is done to the line, then the contour will also be too low.

In the absence of ultra-positive methods, means approaching precision are advocated, and they are these: Let the work be clamped to a trued-up shaper table, and from a gage made from a master, let a contour spring-tool be made. Mark off the contour for the roughing cut and finish with the contour tool. In applying the gage, the shaper table can be used as a base and the side of the work as a measuring face. By these means, positive measurements are provided, since the gage is applied from two places in the most approved way.

Press Tools for Thick Stock

S. A. MCDONALD

The thickness of the stock to be worked plays an important part in the design of press tools, as is demonstrated in the following example: The two-stage gang tools in Fig. 1 were made to pierce and blank the piece *A*, which was made from cold-rolled steel $\frac{1}{8}$ in.

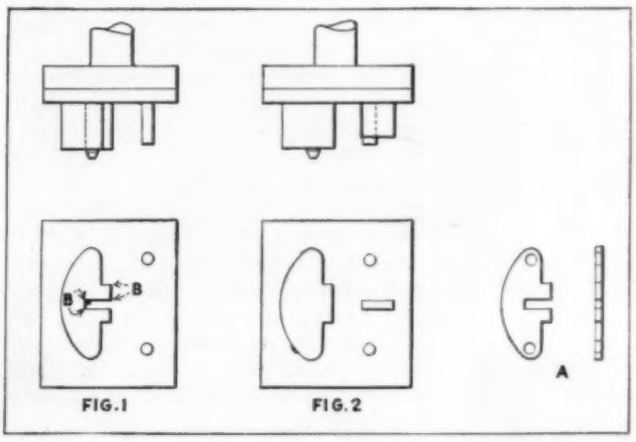


FIG. 1 FIG. 2

thick. A number of faults developed in the tools and the blanks. First, on account of the thickness of the stock the edges of the blanks were too rough for the finish required. Second, the corners at *B* were not as sharp as was necessary, and third, because of the slot being narrow, the punch dulled rapidly and required frequent grinding over its whole face.

A new set of tools, as shown in Fig. 2, were made. In these tools, the holes and the slot were pierced in the stock before the piece was blanked. The piece was blanked in the second stage, but since the slot had been pierced in the first stage, no further provision for cutting it was necessary. This construction of the tools eliminated the rapid dulling of the punch edges. The blanks made in these tools were a few thousandths larger than the ones made in the original tools. As the edges of the blanks were still rough, a nest was made and attached to the original die. When the blanks were put through this die, using the punch that belonged to it, the result was a shaving cut around the contour, leaving sharp corners and fine smooth edges.

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SEEN AND HEARD

JOHN R. GODFREY

Is Kettering Right?

One of Kettering's maxims is that when engineers design new cars that are attractive to the user they will discard the old and buy the new. One at least of the foreign builders has taken him seriously. The Mercedes-Benz combination has announced a thousand dollar sedan on a Ford wheelbase, with independent springing on each wheel, as on some of the costlier cars. Our own engineers have been talking about this type of car, but so far, none have appeared on the market. The car also has four speeds, synchro-mesh transmission and hydraulic four-wheel brakes. Will we follow suit?

Economy That Loses Money

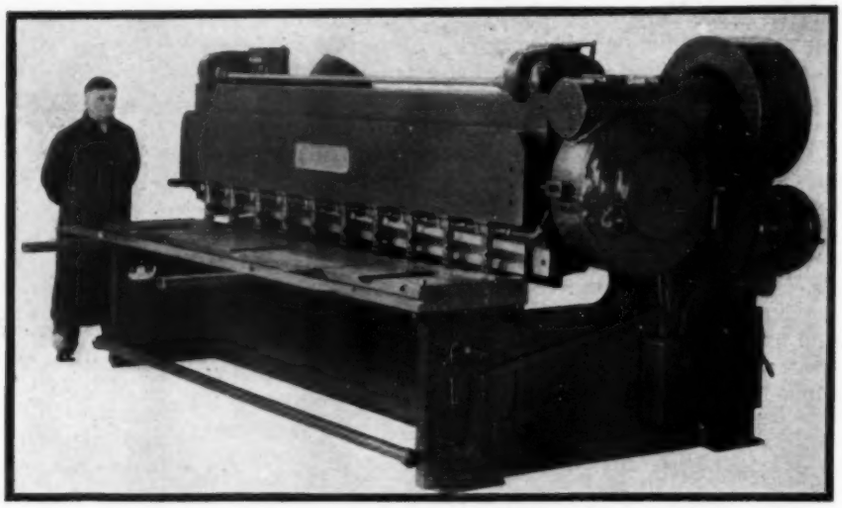
Ideas of economy and management vary between wide extremes. Visiting the maintenance shop of a concern that had bought over a million dollars worth of electrical machinery, I found a homemade lathe for turning commutators on the armatures. Inquiry revealed the fact that the man with the check book had refused to buy a lathe for the purpose, on grounds of economy. So the shop man had to build one to keep the motors running. It cost more to build than a good lathe bought on the open market, and the cost had to be camouflaged under the head of shop expense. And though the man who thought he "saved" money for the company patted himself on the back, he had really defrauded his stockholders and the lathe builder.

T-C Tools Again

Tungsten-carbide tools are still the subject of much discussion and from many angles. The saving in equipment, because of increased output per machine, is often a larger item than the lowered labor cost per piece. One shop is introducing T-C tools on jobs where the operator must watch the work rather than where one man runs several machines. Another consideration is the effect on the group of machines on a given part. There is no great saving in speeding up one operation on a single machine unless the other operations can keep pace.

Some shops are taking this time to familiarize the men with using T-C tools. They meet with the usual objections to new things and get adverse reports from men who ought to know better. When men are made to realize that it is their job to make tools work, they will usually find a way to do so. One point to consider is that T-C tools generally utilize about twice the power needed by the older tools.

SHOP EQUIPMENT NEWS



Hydraulic hold-downs, the worm drive, and the front gages are shown. The 18-in. gap is standard

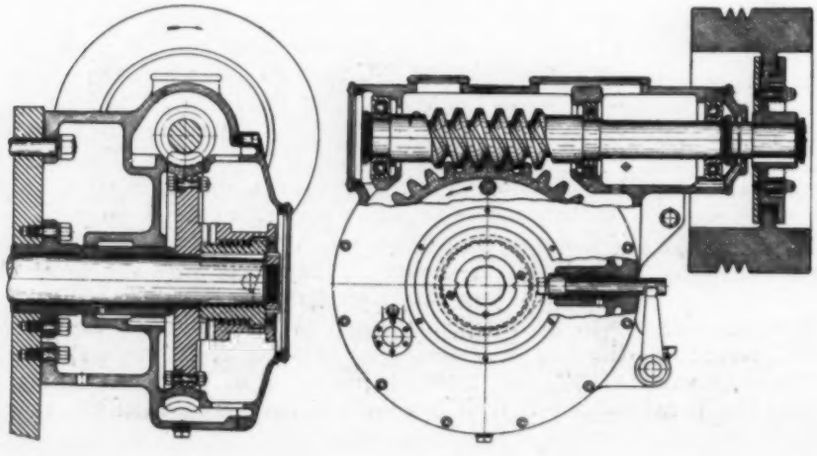
Cincinnati All-Steel Shear With Hydraulic Hold-Downs

Hydraulic hold-downs, a low rack or shear angle, main members of steel plate, the lowered drive shaft, the non-floating knife bar, and worm drive are features of the all-steel shear developed by the Cincinnati Shaper Co., Elam St. & Garrard Ave., Cincinnati, Ohio. These features permit accurate squaring and slitting at higher than ordinary speeds. The $\frac{3}{16}$ in.—10 and 12 ft. shears operate at 60 strokes per min., and the $\frac{1}{2}$ in. —10 and 12 ft. shears at 40 strokes per min. Clamping pressure at each hydraulic hold-down is uniform regardless of variations in the thickness of the sheets. Slippage of the sheets is therefore eliminated, and straight and parallel cuts that produce square sheets are secured without setting the squaring arm out of square and the back gage out of parallel in order to compensate for side movement of the sheets. The low rack or shear angle, which is $\frac{5}{16}$ in. per ft. on the $\frac{3}{8}$ in.—12 ft. shear, greatly reduces distortion of the work and eliminates wedge-shaped pieces.

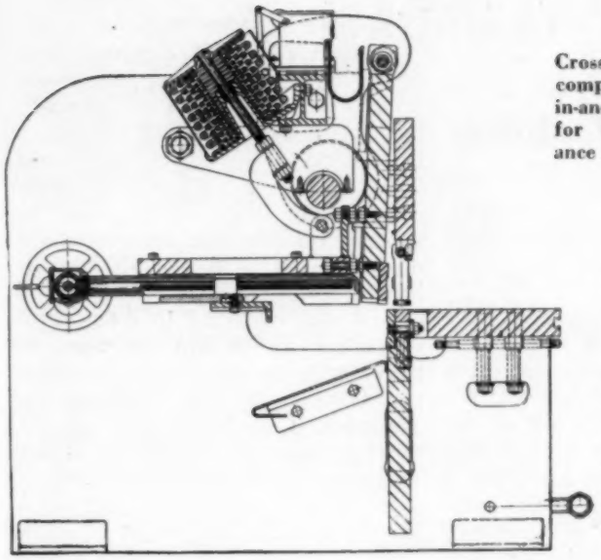
The main members are made of rolled steel plate to secure the necessary accuracy and long knife life. These members comprise the housings, upper and lower knife bars, bed, pitman links, and back brace.

The low compact design results from the position of the drive shaft, which extends behind the upper knife bar instead of above it. Through eccentrics this shaft pulls downward and slightly backward on the knife bar by means of steel pitman links, to hold it securely against the hardened flat guide bearings. Instead of pulling directly upward on the knife bar, the two spring counterbalances pull backward as well as upward. This action also holds the knife bar against the hardened flat guide bearings on the housings. This construction is important as the knife bar is held against the bearing guides regardless of wear in the slides. The knife bar does not float.

Besides holding the knife bar against the housing bearings, the spring counterbalances perform the



During overloads the flywheel slips on its mounting, which is adjustable for the degree of overload sustained



Cross-section of the complete shear. Table in-and-out adjustment for the knife clearance is shown

function of a brake on the shear. The multiple, low-tension springs are designed with a counterbalancing action such that they hold the upper knife bar at the top of the stroke when the clutch is disengaged.

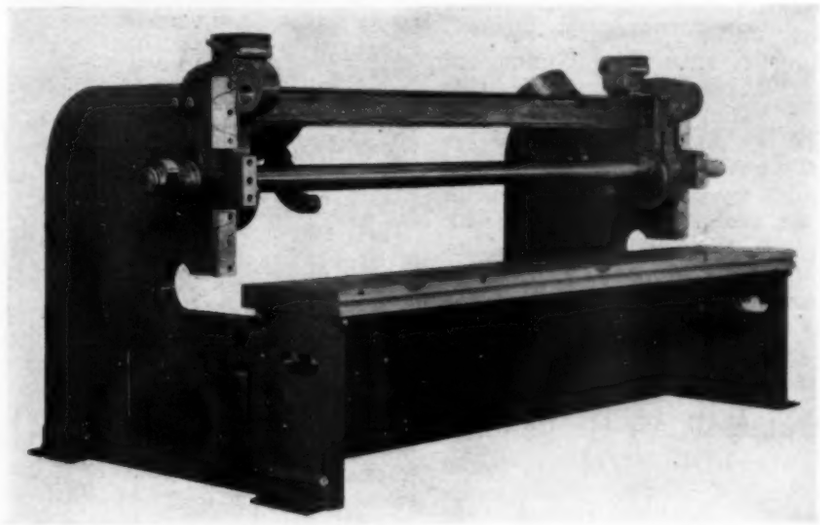
A deep steel plate is used for the upper knife bar, and hardened and ground guide bearings are mounted on the housings. The knife bar slides, bronze lined, bear around this guide. A deep horizontal steel brace is fastened to the back of the upper knife bar to prevent the knives from springing apart. Adjustment is provided between this brace and the bar at 12 in. intervals so that exact alignment of the knives can be maintained.

A vertical adjustment to the upper knife bar for use when slitting has been provided and is controlled at one point. When this vertical adjustment is in the "up" position, the knives do not pass at the open end and the shear can be used for slitting. When the adjustment is in the "down" position, the knives come together for their entire length and the shear is used for squaring and notching.

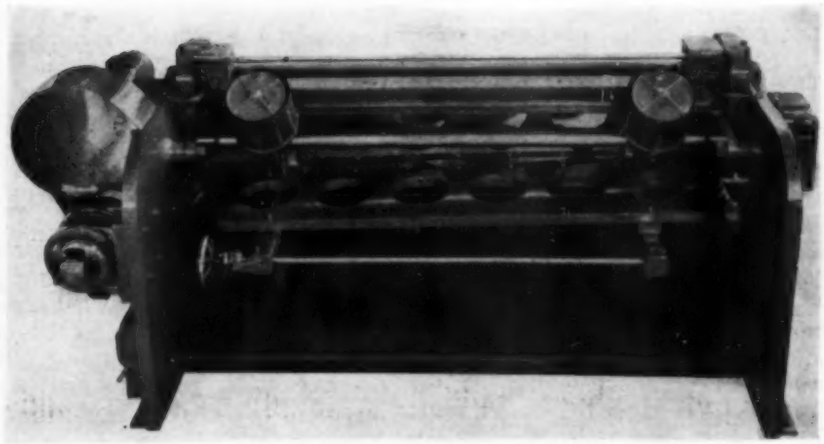
Drive from the motor to the flywheel is made by V-belt. Safety friction disks are used in the flywheel to prevent damage to the shear from overload. These disks can be set to take varying loads. Drive is taken from the flywheel shaft through a worm and wheel reduction unit to the main shaft. The worm is hardened and ground and mounted on anti-friction bearings. The worm-wheel has a rim of high-tensile, worm-gear bronze mounted on a steel disk. Five clutch jaws are cut in the disk. The clutch is slidably mounted on a hardened splined sleeve which is keyed and fits on the tapered end of the drive shaft. When the clutch pin is withdrawn by depressing the treadle, a heavy spring forces the solid jaws into mesh. The clutch parts are hardened and run in a bath of oil.

The bed rests directly on the solid housing plates, and is adjustable backward or forward to obtain proper knife clearance. It is arranged with recesses so that the lower knife bolts can be reached from above and at the front of the machine. These recesses are covered with a steel plate machined flush with the bed. Finger slots enable the operator to grasp the sheet.

Standard sizes of these shears are offered for 10 gage, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in. plates. Standard lengths are 6, 8, 10 and 12 ft. Lengths of 14 and 16 ft. are also available. The ratings are for continuous or mill duty at maximum rated capacity. Standard equipment on all sizes includes one-piece, four-edge knives; front, side and universal ball-bearing back gages, and V-belt motor drive to the flywheel.



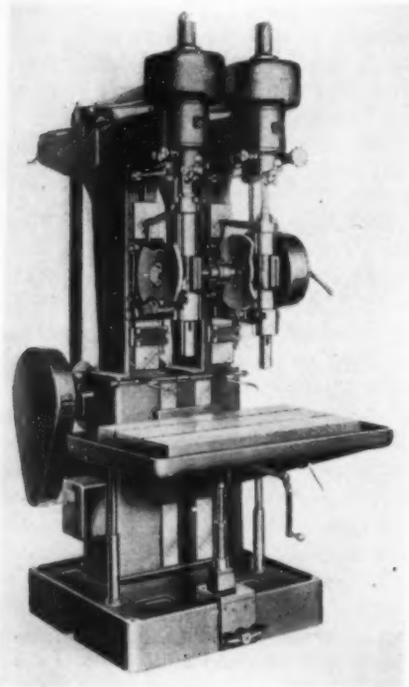
Drive shaft and spring counterbalances in position. The steel pitman links pull the upper knife bar backward and downward and the counterbalances pull it backward and upward to eliminate float



Rear of shear, showing the adjustable back brace for the knife bar and the back gages with direct-reading dials

Allen No. 3 Ball Bearing Drilling Machines

Belted-spindle drilling and tapping machines in the No. 3 size have been improved by the Chas. G. Allen Co., Barre, Mass. The machine is available with from one to six spindles in 12-in. overhang. Rated drilling capacity in steel is 1¼ in., and power is provided together with suitable speeds for boring, reaming and spot facing operations up to 2½ in. in diameter. Four spindle speeds are provided by the combination of a two-step spindle pulley with a two-step cone on the backshaft. Heat-treated back gears of the sliding type and fully ball-bearing equipped give a series of four slower speeds. These backgears are built into the machine.



Allen No. 3 Ball Bearing Drilling Machine with cam-feed spindles and chain drive from the motor at the rear

The alloy steel spindle is multiple splined and has a No. 4 Morse taper socket. It is equipped with heavy-duty radial thrust bearings inclosed in the quill. No sleeve bearings are employed in the drive of this machine.

Power feed is applied through a hardened and ground worm running in oil and constantly in mesh with the wormwheel. Pulling down on the hand lever engages the power feed; lifting up the lever disengages it. The feed clutch is a balanced three-shoe, toggle-friction device, self-adjusting for wear. All feed gearing is entirely inclosed in the head, under the spindle pulley.

A cam feed, such as illustrated, can be furnished in several different forms. With this arrangement there is no rack on the spindle quill, and the downward and upward move of the spindle is controlled by a plate cam on the horizontal pinion shaft and a roller and lever attached to the spindle quill. The illustration shows two connected cam-fed top spindles, with cams staggered for alternate loading of each spindle. The machine is intended for continuous operation, as is also the case where a single cam-feed spindle is timed up with an automatic indexing table. A cam with the right number of lobes can also be furnished for drilling deep holes and is arranged to give the necessary pull-outs to the drill, in which case the cam makes a single revolution and stops. It is started again by pressing on the feed lever.

The No. 3 tapper top column has an automatic reversing spindle and provides three open belt speeds for drilling and light tapping, and with backgears three reduced speeds for tapping up to 1½ in. in cast iron. A self-contained motor drive can be supplied.

"Ontario" Air-Hardening Die Steel

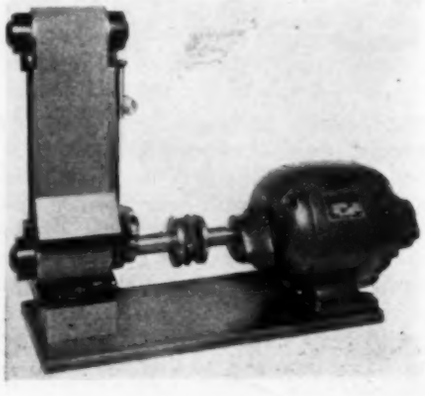
A high-carbon, high-chromium die steel is being marketed under the trade name of "Ontario" by the Ludlum Steel Co., Dunkirk, N. Y. It possesses the properties of this class of steels, such as resistance to abrasion, high hardness and non-deforming characteristics, but in addition has greater toughness and is easier to machine than the oil-hardening types. It is suitable for such applications as: blanking, stamping and cold forming dies, particularly where distortion on warpage are to be avoided, thread rolling dies, either for hot or cold material; bending, forming, and seaming rolls; punches and shear blades, particularly for light gage material.

Ontario die steel develops practically the same hardness when cooled from still air as when oil quenched, but in either case the full hardness is best obtained by pack hardening. Tools which are not subjected to any considerable shock or are used for working on thin gage material can be drawn as low as 400 to 450 deg. F., leaving a Rockwell C hardness of 62-63. Tools subjected to considerable shock, or which are operating on heavy gage material should be drawn to 600-800 deg. F., developing a Rockwell C hardness of 56-58. In the fully annealed condition a Brinell hardness of 196-212 is obtained.

Coats Abrasive Belt Grinder

Seven sizes of an abrasive belt grinder have been placed on the market by the Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y. The No. 0 is illustrated and is the smallest of the line. In this machine either horizontal or vertical positions can be secured by means of a base which is machined at right angles. On larger size machines the horizontal type is converted into a vertical type by bolting it to an upright. All machines are equipped with ball bearings, including the loose pulley.

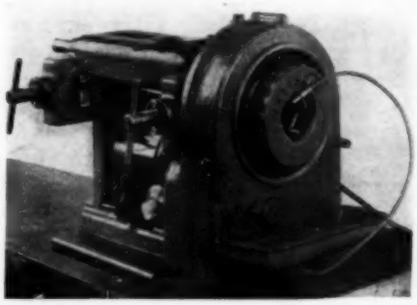
Belt take-up is effected while the machine is running by means of a pin wrench. A track regulating device permits tilting or tipping the drum toward or away from the horizontal line, this being done by means of a micrometer screw. All sizes of machines are so equipped, and a locknut locks the position of the drum. This track-regulating device makes up for inequalities in the length of belt from side to side and permits the operator to run the belt at the very edge of the table. The belt-shifter fork turns



upon its axis so that belt-drive from any direction is possible. An extension table can be attached to any machine and permits the grinding out of frames with keen sharp edges.

Axelson Portable Pipe Threading Machine

The Axelson Mfg. Co., Ltd., P. O. Box 710, Vernon Station, Los Angeles, Calif., is offering an improved design of its portable pipe threading machine, which is capable of threading ½ to 2-in. pipe. The weight of the machine is 190 lb., and



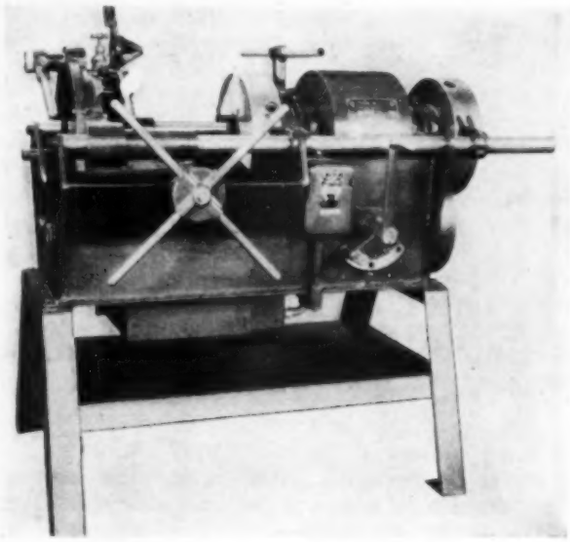
to operate it it is only necessary to set it up in a convenient location and attach the plug to a standard light socket. Bolt threading dies may also be used, although they are not furnished as standard equipment.

Automatic self-centering jaw chucks make it easier to center any size of pipe material. The cutter head or reamer is readily installed. An oil pump insures proper lubrication while threading.

"Toledo" No. 1-2-4 Pipe Threading Machine

All-steel construction, together with other design improvements, are responsible for high speed in threading, cutting-off and reaming of 1 to 4 in. pipe with the Toledo No. 1-2-4 machine. Four inch pipe can be cut off in nine seconds and threaded in 42 seconds. Two inch pipe is cut off in 3½ seconds and threaded in 18 seconds. Faster speeds are possible at the discretion of the operator. The machine is built by the Toledo Pipe Theading Machine Co., Toledo, Ohio.

Rake dies—a separate set for each size of pipe—assure smooth threads. A separate, quick-opening diehead of special design is used for each size of pipe. Die heads are not only adjustable but can be interchanged by slipping off the supporting posts. Each chaser can be independently adjusted for depth. Dies are lubricated by a supply of cutting oil, from a centrifugal type pump which will pass chips without clogging or damage. Six spindle speeds are obtained by a clutch lever and gear shifting lever. Cutting speed is approximately 3½ times the threading speed. The multiple-disk clutch enables the operator to stop the spindle instantly or to ease it gradually to any desired position. Reverse for left-hand threading is obtained electrically by throwing the switch to reverse and operating two reverse gears. All gears are machine cut and run in oil. Two chucks are used on the machine. The rear chuck is fitted with step jaws and gripping flanges.



Toledo No. 1-2-4 Pipe Threading Machine which features all-steel construction

"Zurcosteel" Steel Sheets

Three grades of steel sheets to meet practically all requirements have been placed on the market by the L. E. Zurbach Steel Co., Sixth & Bent Sts., Cambridge, Mass. Coated sheets such as galvanized and long terne, and enameling or electrical sheets are not included in this range. The "Zurcosteel" A sheet is equivalent to cold-rolled strip steel, having equal drawing properties and similar surface; that is a bright clean surface, free from annealing discoloration and scale.

The Zurcosteel B is carried in stock dry to take care of requirements for use in the manufacture of filing cabinets, refrigerator boxes, and other places where a flat sheet is required and where very little drawing properties in the sheet are necessary, but where the sheet is desired for painting or enameling. Zurcosteel C is hot-rolled continuous strip mill product, pickled, and of deep drawing quality. Zurcosteel AAA is carried in stock up to 0.032 in. thick and is specified where sheets of a good drawing quality, bright finish, and special accuracy to gage are required, the variation being guaranteed to be within plus or minus 0.001 in.

Allen-Bradley Face-Plate Speed Regulator for Slip-Ring Motors

A speed regulator of the face-plate type for varying the resistance in the secondary circuit of slip-ring motors is a recent development by the Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis. The Bulletin 555 speed regulator, as this device is known, is suitable for motors up to 25 hp., and is provided with a faceplate of either 25 or 75 amp. rating with an operating handle outside the inclosing cabinet. The inclosing cabinet can be omitted. Auxiliary contacts are pro-

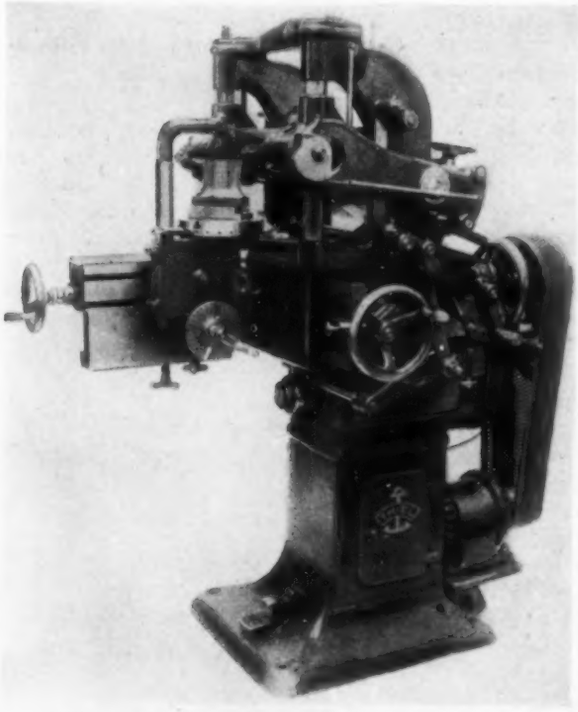
vided for closing a separate magnetic primary switch when the hand lever is on the first speed position. Disconnection of the motor from any cause makes it necessary to move the lever back to the first position to pick up the primary switch, thereby preventing starting of the motor without all resistance in the three phases.

This switch can also be provided with a magnetic primary starting switch and thermal overload relays. The combined speed regulator and switch is known as Bulletin 556 and has the advantage of eliminating some of the conduit work that is necessary when the speed regulator and switch are installed separately.

Thiel 32 Vertical Punch and Form Shaper

For the manufacture of irregular shaped punches or similar work, Marburg Brothers, Inc., 90 West St., New York, N. Y., have placed on the market in the United States the Thiel 32 vertical punch and form shaper, which is a German machine. An ordinary cutting tool is used to produce one-piece solid punches quickly and accurately. The cutting tool after completing its downward travel swings back and thus produces the supporting shoulder for the punch. The radius is predetermined, with a minimum of $\frac{1}{2}$ in. Radii and spacings are easily and accurately shaped by the aid of a dividing head. All adjustments are easily made from the right-hand side of the machine.

A quick-change gearbox provides three speeds, according to the type of the material, degree of finish, or length of stroke. The latter can be regulated from $1\frac{1}{2}$ to 4 in. The power cross-feed has a maximum travel of about $8\frac{3}{4}$ in. and is adjustable from 0.006 to 0.017 in. in either direction. The planing width is $8\frac{3}{4}$ in.



Thiel 32 Vertical Punch and Form Shaper which has the tool controlled by linkage so that it shapes the punch form, together with a radius for a supporting shoulder

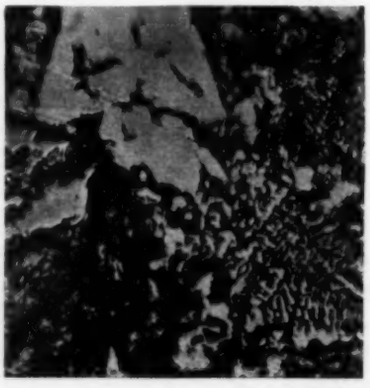
"American" Model P-31 Pot Furnace

A heating element formed of one continuous helical coil is used in the model P-31 pot furnace developed by the American Electric Furnace Co., 27 Von Hillern St., Boston, Mass. This coil in some sizes is formed from square stock and in other sizes from round stock. It is retained in place in spiral grooves in the heating element tile, and requires no added framework, hooks, retailing bars or other mechanism. The unit may be removed from the furnace and is easily reinstalled. In addition, the heating element tile with or without heating elements may be removed. The outer shell is of heavy steel plate supported on an annular cast-iron base ring. A patented double flange on the pot fits into and over a groove in the supporting ring. The groove is filled with cement and the pot forced down into place under pressure. The supporting ring is also sealed to the top ring in the same manner.

Specifications of the model P-31 are as follows: Diameter of pot, 10 in.; depth of pot, 18 in.; kw. consumption, 18, capacity in lb. of steel per hr. to 1,500 deg. F., 150; height of pot above floor, 36 in.; outside diameter, 42 in.; voltage, 220; phases, 1; shipping weight, 2,150 lb.

"Blackor" Abrasive-Resistant Facing Material

The Lincoln Electric Co., Cleveland, Ohio, has been appointed general industrial distributor for "Blackor," an abrasion-resistant facing. This is a black granular material of tungsten carbide and is applied to tools subjected to abrasive wear in order to do away with the use of insert metals. It is applied with a carbon arc. The microphotograph shows deposited Blackor magnified approximately 500 times. The lighter portions are tungsten carbide and the



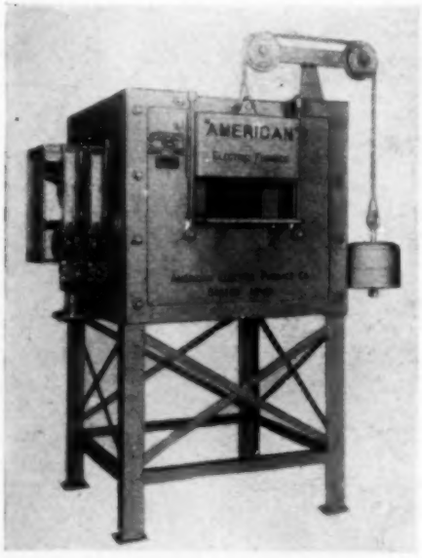
dark portions are the softer binder. The crystals are interlaced.

Among the characteristics of Blackor are the following: It maintains its abrasion-resisting quality at red heat; it is fused with the arc so that it will bend with the parent metal without flaking off; the facing becomes harder toward the nitride and is in performance like case-hardened steel; it has a scratch hardness of 9 plus. Applications include fishtail, disk and diamond drills, shovel teeth, grinding shafts, and others.

Blackor is sold in 1 and 5-lb. waterproof containers. The cost of application is quite low. The power cost should not exceed 10 to 15 cents per hour. One ounce of the material will cover 3 to 4 sq.in.

"American" Model HB-10 High-Speed Furnace

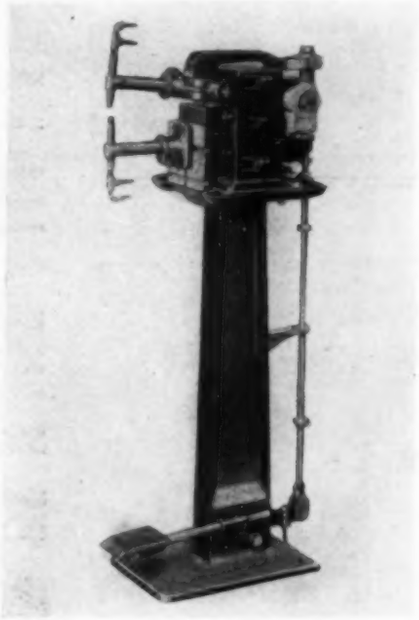
The smallest size of its line of HB furnaces, the HB-10, has been announced by the American Electric Furnace Co., 27 Von Hiliern St., Boston, Mass. This furnace is equipped with four horizontal Globar heating elements, two above and two below the heating chamber. These are equipped with water-cooled terminals, and a visible drain is provided on the water supply coming from the terminals. The furnace is also fitted with a patented atmospheric control with manometers on both the air and gas lines. These manometers permit the operator to duplicate any previous condition of protective atmosphere.



The operating range of this furnace extends to 2,500 deg. F., and the unit can be used on production schedules, if desired. Effective working area of the chamber is 8 in. wide by 12 in. deep by 5 in. high. Current consumption is 20 kw. and the approximate shipping weight is 1,800 lb.

Eisler Spot Welding Machines

Spot welders from ½ to 35 kva. are now manufactured by the Eisler Electric Corp., 744-772 South 13th St., Newark, N. J. This line makes possible the handling of combined thicknesses of steel from .00052 to ⅝ in. Both foot and motor-driven types are available. A feature of this machine is the small transformer size resulting from improved design, so that the machine itself is considerably smaller than usual. A wide range of heating steps is provided. Various types of jaws can be had to suit special requirements.

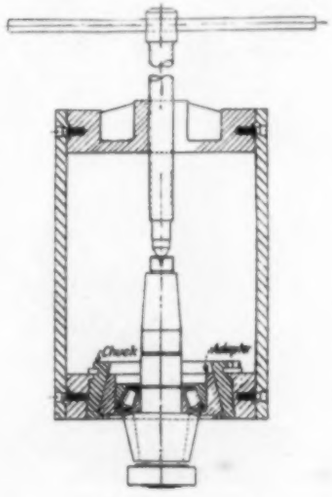


"Square D" Class 2510-W5 Starter

The Industrial Controller Division of the Square D Co., 710 South Third St., Milwaukee, Wis., has announced a Class 2510-W5 manual starter. This three-pole starter is designed to control across-the-line single and polyphase motors of 2 hp. or less. It is particularly applicable to machine tool installations and suitable for general applications where remote control and low-voltage protection are not essential. Overload protection is provided by time-limit thermal relays which are front reset. Tripping of either relay opens all three lines. The starter is arranged for wall or pedestal mounting. Dimensions are: width, 4½ in.; height, 7¼ in., and depth, 3¾ in.

Curtiss & Smith Universal Dismounting Press

For dismounting ball bearings, gears, bushings, collars, cams and pulleys from shafts, the Curtiss & Smith Mfg. Corp., 245-251 South St., Newark, N. J., has developed a

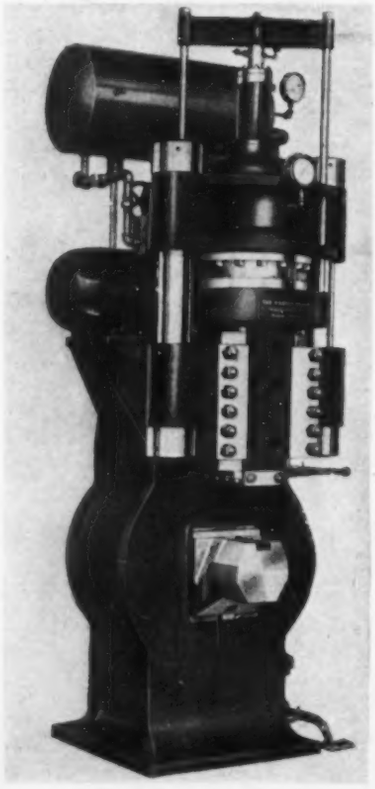


universal dismounting press. It is required only to put in the chucks and adapters, if necessary. The press screw is turned and the bearing or other part is dismounted. In the case of a bearing, the pressure is distributed equally on all balls or rollers. The press is made in several standard sizes and designs, each of which will dismount a wide range of sizes and shapes of various parts. It may be built also for extracting shafts.

"Hydromatic" High-Speed Hydraulic Presses

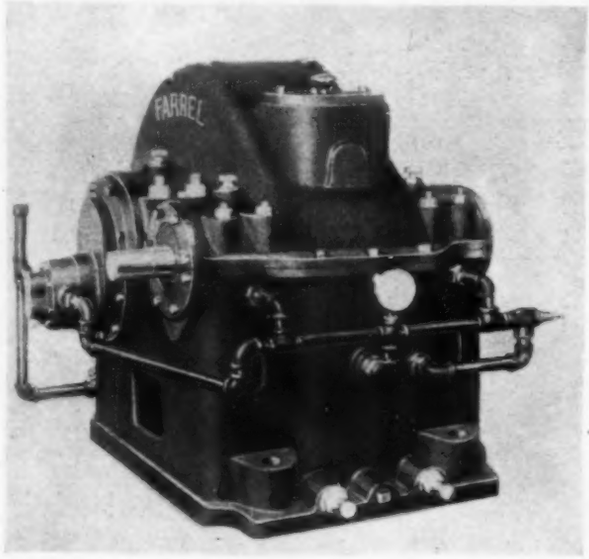
Hydraulic presses in horning and column types, and with columns inclosed in large housings for gib guiding of the moving platen, were placed on the market by The French Oil Mill Machinery Co., Piqua, Ohio. These self-contained hydraulic press units are known under the trade name of "Hydromatic." Operation is by a pedal or hand lever, the latter also acting as an emergency release at any part of the cycle. The unit can be set to operate at any desired stroke or pressure, and when the latter is reached the press will reverse instantaneously to open position, or it can be set to hold the desired pressure for any desired period of time and then return automatically.

The 300-ton horning press, illustrated, has a cycle speed of 35 strokes per minute. Because of the integral hydraulic unit the press can be shifted to any part of the plant without disturbing the piping connections.



Farrel-Birmingham High-Speed Gear Units

High-speed gear units suitable for increasing speed of the driven unit, as well as reducing the speed, have been developed by the Farrel-Birmingham Co., Inc., Buffalo, N. Y.



Used as connecting units for plant prime movers, this Farrel-Birmingham High-Speed Gear Unit is built for speeds to 6,000 r.p.m.

These gear units are especially adapted for connecting Diesel or gas engines to high-speed centrifugal pumps and similar service. When a gear unit is required for connection to a steam turbine or for any other purpose where the speed of the pinion shaft is over 1,800 r.p.m. it has been considered special. However, this company has developed and standardized a series of gear units suitable for speeds up to 6,000 r.p.m. and powers from 120 to 2,500 hp., with ratios up to 10 to 1 for either increasing or reducing speed. Gears used in these are the Farrel-Sykes herringbone continous tooth type. A complete lubrication system is provided, together with an oil cooler.

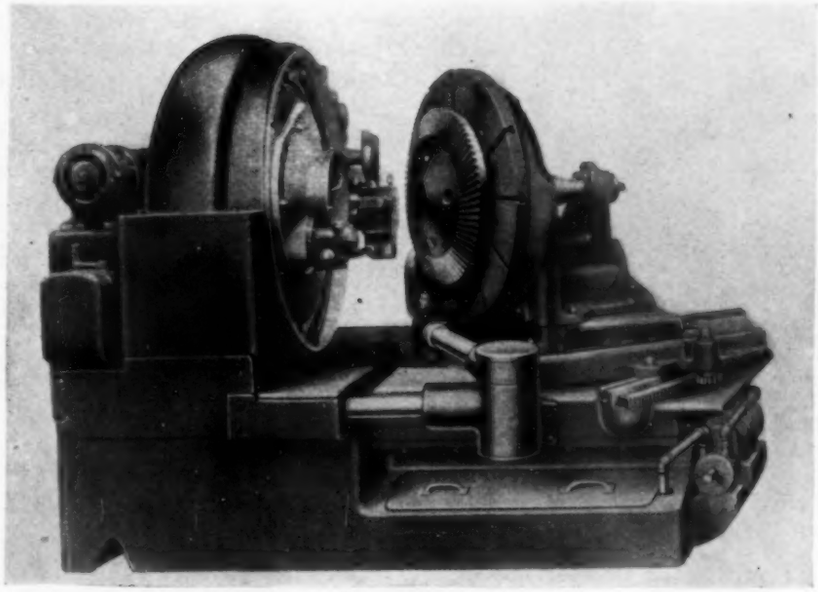
Brown & Sharpe Pressure Relief Valve

Developed for use with hydraulically operated machinery, a pressure relief valve has been placed on the market by the Brown & Sharpe Mfg. Co., Providence, R. I. This valve is particularly adapted to operate in connection with hydraulic mechanisms and with the Nos. 53 and 55 rotary geared pumps.

By removing the hexagon cap and turning the adjusting screw, the compression on the valve springs may be adjusted so that the valve will operate at pressures from 0 to 200 lb. per sq.in. Guides on the valve prevent fluttering and noisy operation. Features of the device are the large valve chamber, which permits a ready escapement for the by-passed liquid, and the double spring arrangement which gives wide range and flexibility. The valve is made to take 1-in. piping.

Brown & Sharpe Pressure Relief Valve for use with hydraulic systems and the Nos. 53 and 55 rotary pumps

Gleason No. 40 Spiral Bevel Gear Planing Generator



As an addition to its line of large spiral bevel gear planing generators built in 60 and 90 in. sizes, the Gleason Works, 1000 University Ave., Rochester, N. Y., has brought out a machine to cut spiral bevel gears which are beyond the capacity of the 25-in. spiral bevel gear generator, but which are not sufficiently large to warrant cutting them on the 60-in. machine. If it is desired to cut hypoid gears on this machine, a special workhead can be supplied for generating correctly the pinion in the offset position in which it is to run.

This machine employs a single tool and is universal within its range. The tooth profile is obtained with a generating action which consists of a relative rolling motion between the tool carrying cradle and the work spindle, corresponding to that of a gear rolling with a crown gear of which the tool represents a tooth. The correct ratios of roll for different pitch angles are obtained by change gears.

The tool is reciprocated in a straight slide by a simple crank drive, while the blank is rotated on its axis continuously at a uniform rate. As in the larger machines of the same type, the cradle which carries the tool slide is given a slight rocking motion, which combined with the rotation of the blank and the movement of the tool in a straight line, produces the desired curve of the tooth across the face of the gear.

The tool cuts in a different tooth space on each stroke. When the cut is finished the machine is stopped automatically. The setup for finish cutting is the same as for rough cutting, but different tools are used and each side of the tooth is finished separately. There are 12 speeds, from 11 to 70 strokes per min. The rate of feed is adjustable throughout the range of the machine.

SPECIFICATIONS

CAPACITY

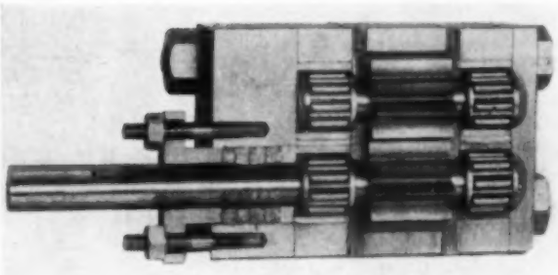
Longest cone distance:	
25 deg. spiral angle	20 in.
15 deg. spiral angle	24 in.
Largest pitch angle:	
Shafts at 90 deg.	84 deg. 18 min.
Smallest pitch angle:	
Shafts at 90 deg	5 deg. 42 min.
Extreme ratio:	
Shafts at 90 deg	10 — 1
Largest pitch diameter:	
10–1 ratio (25 deg. spiral angle)	40 in.
6–1 ratio (15 deg. spiral angle)	48 in.
1–1 ratio (25 deg. spiral angle)	28 in.
(15 deg. spiral angle)	33 in.
Minimum number of teeth in miter gears	16
Largest pitch (Gleason system)	1
Longest face	7 in.

MISCELLANEOUS

Floor space, approximately	90 in. x 120 in.
Net weight	36,000 lb.

Northern XD Series Rotary Pumps

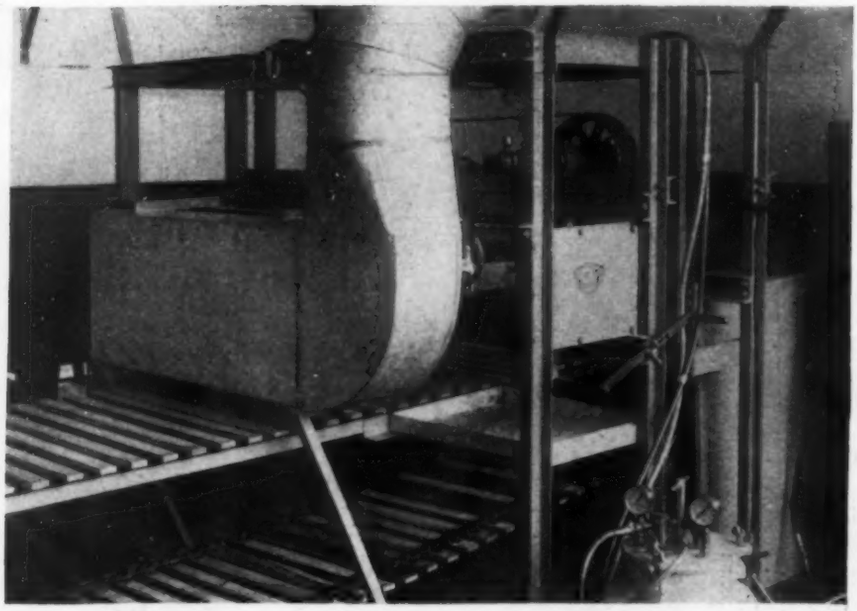
The next larger size of Nitralloy rotary pumps has been added to its line by the Northern Pump Co., Minneapolis, Minn. This XD series is of the same construction as the XA series, described on page 560, Vol. 74. The capacity ranges from 1 to 15 gal. per min. Two types of bearing construction are available. Nitralloy



bearings for supporting the pump shafts are used in pumps to handle fuel oil, coolant and any other liquid with little or no lubricating value. Roller bearings are incorporated in pumps for handling clean lubricating oil, especially for high pressure conditions such as 1,000 lb. per sq.in.

Beach Automatic Paint Spraying Machine

An automatic paint spraying or finishing machine for production work has been placed on the market by the Willard C. Beach Air Brush Co., 201-207 Second St., Harrison, N. J. This machine, known as the



Beach "Automatic Spraycoater" for conveyor installations

"Automatic Spracoater," automatically spray-finishes objects carried by a conveyor or material fed through rolls. It can be adapted for a wide range of work and for use in the manufacture of steel furniture, refrigerators, sheet metal work, electrical equipment, toys, stove and range parts. The design and construction of the machine is such that the spray gun, operating at high speed, passes back and forth over the work, shutting off automatically at the end of each stroke. This feature insures uniform finish, free from runs and "holidays," and reduces the waste of material. By using two or more guns, two-tone, mottled and rainbow finishes can be obtained. The spray coating can be regulated or adjusted from a side control while the machine is in operation.

EQUIPMENT ADAPTATIONS

RECENTLY DEVELOPED BY THE MAKERS

Rockford Multiple-Way Machine for Machining a Special Bearing

For performing several operations on a special bearing, the Rockford Drilling Machine Co., Rockford, Ill., has designed the multiple-way machine illustrated in Fig. 1. With the use of this machine four lathes are replaced and the workmanship is better on the part. The part illustrated in Fig. 2 consists of a special bearing made up of two halves. The operations are as follows:

1st Station—Operator unloads part from holding fixture with following operations completed, and reloads with a rough part.

2nd Station—Core drill, also rough turn and face, from both ends.

3rd Station—Semi-finish bore, also finish turn and face, as well as chamfer, from both ends.

4th Station — Take rough cut on recess at center of bore.

5th Station — Take finish cut on recess.

6th Station—Finish ream.

Because the machine can be used on large as well as small parts, it is furnished in the heavy-duty size to eliminate chatter and assure the desired accuracy.

The spindles in each head are built into a separate unit, known as the spindle-unit, which fits into the front compartment of the machine head. The main drive shaft of the spindle unit connects with the drive shaft of the machine head. The advantage of this unit construction is the possibility of interchanging the spindle units, so as to adapt the machine to changes in the part or for use on an entirely different part.

Both machine heads, complete with motors and spindle units are traversed simultaneously by means of a hydraulic pump. The operation cycle is completely automatic and consists of rapid forward traverse to a predetermined point, automatic slow up to proper feed, feed for the required distance, automatic dwell for the facing operation, and then automatic

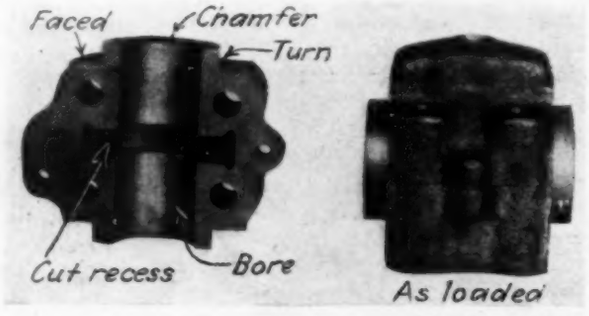


Fig. 2—Special bearing which is completely machined at the six stations of the special setup illustrated

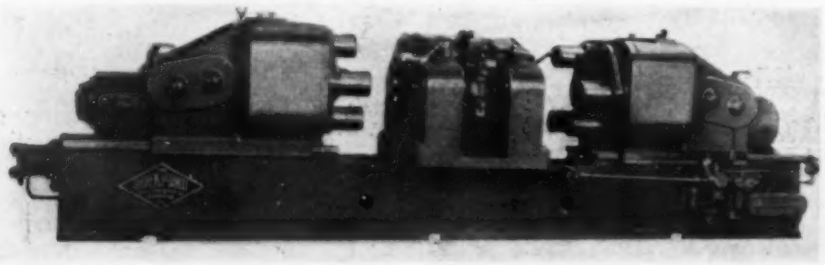


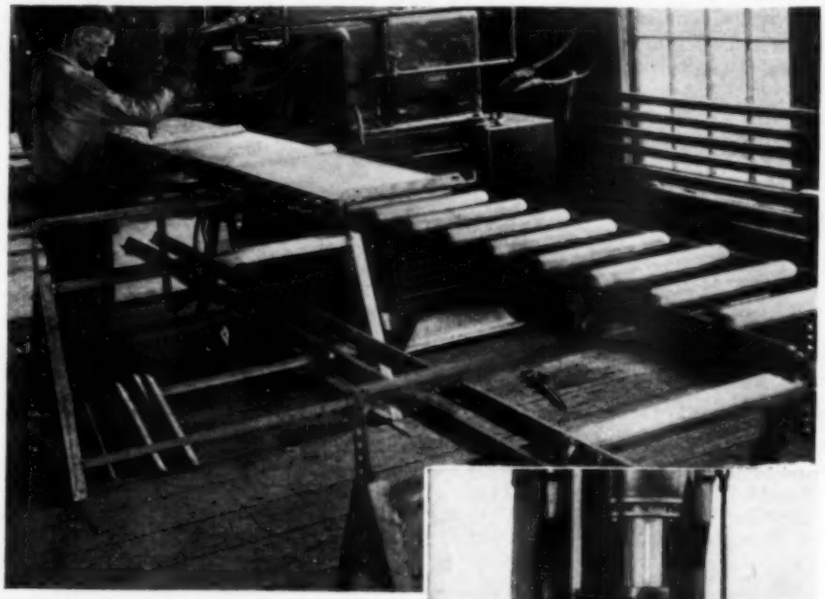
Fig. 1—Unit construction permits changing spindle units when part changes are made

rapid return traverse to the starting position and stop.

The six-sided indexing drum carries locating and holding fixtures on each side. Hardened and ground steel guide bushings for the tools are used in the table support brackets.

Mathews Conveyor for Sheet-Metal Welding Operations

The Mathews Conveyor Co., Ellwood City, Pa., has developed an adjustable conveyor system for speeding up metal-welding operations. The unit is made up of adjustable metal supports, on which is placed a section of roller conveyor. The sheet metal to be welded is placed on the rollers and can then be moved easily in a horizontal plane, back and forth under the arc-welding machine contacts, as well as to the right or left on the roller conveyor bed.



Assembling Grease Retainers in an Axle Housing

The American Broach & Machine Co., Ann Arbor, Mich., has developed a special hydraulic press arranged with a double fixture and double ram for the purpose of assembling grease retainers in the bottom of an axle housing and also for pressing an outer Timken bearing race in the flange end of the housing. Fig. 1 shows the axle in place. On the table can be seen one of the outer Timken races and one of the grease retainers. These two members are slipped over the nose of the ram, which is provided with a spring plunger for holding them in position. Immediately upon pushing the pedal the two rams move downward and press their respective parts in the axle housing. The operation requires about ten seconds, floor to floor.

Fig. 2 shows the rams in the extreme downward position without the work in place. The small ram has traveled approximately 20 in., while the top ram has traveled approximately 6 in. The machine is arranged with a ram within a ram and with two cylinders mounted together, one of a larger bore than the other. The smaller diameter cylinder at the top of the machine feeds the small ram so as to give it a high rate of travel.

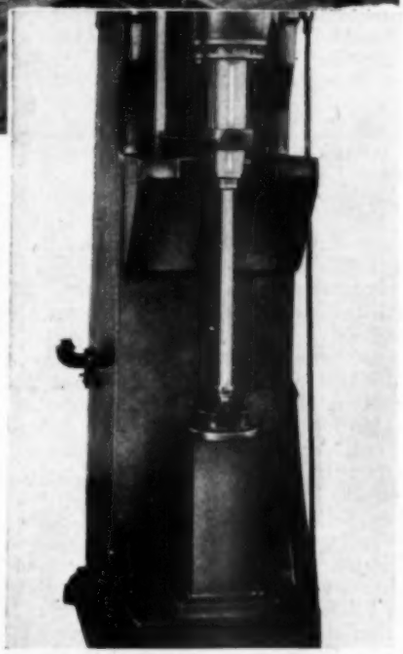


Fig. 2—Rams in the extreme downward position

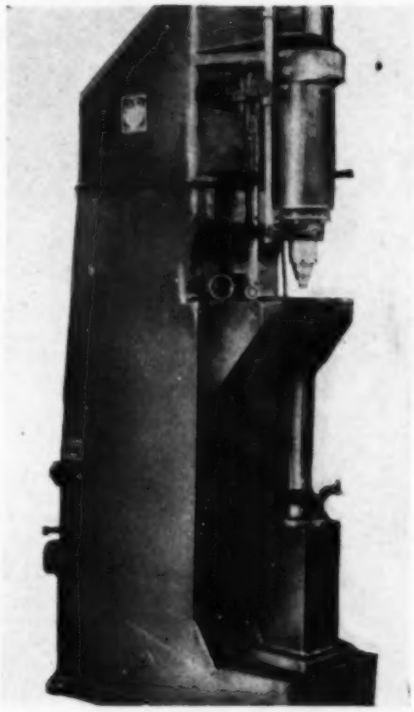
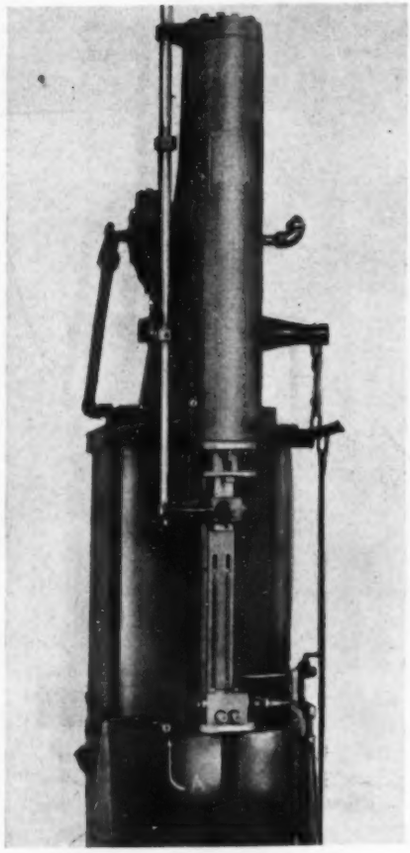


Fig. 1—Axle in place on American hydraulic press for pressing grease retainer and an outer Timken bearing in place

External Broaching of a Slot in a Transmission Idler-Gear Shaft

The American Broach & Machine Co., Ann Arbor, Mich., has furnished a V-2 six-ton broaching machine for broaching a slot $\frac{1}{8}$ in. wide by $\frac{3}{16}$ in. deep in the end of a transmission idler gear shaft. Two parts are broached at a time, and are placed in a fixture controlled by quick-clamping means, which are locked by pulling a lever. Two broaches are mounted in the broach holder.

After the pieces are placed in the fixture, the pedal is depressed, causing the broaches to travel on the downward stroke across the end of the work. Upon the completion of the cut, the automatic stop raises the



American V-2 machine set up for external broaching of a slot in two shafts

pedal and the operator removes the two pieces and releases the pedal so that the broach holder returns to the starting position. The time required for broaching the two pieces is 12 seconds, floor to floor. The parts are approximately $1\frac{5}{16}$ in. diameter and $4\frac{1}{2}$ in. long.

PATENTS

OCTOBER 20, 1931

Metal-Working Machinery

Drill Press Feed. William Welton Edwards, Los Angeles, Calif. Patent 1,827,937.

Truing Mechanism for Grinding Wheels. William LeRoy Bryant, Springfield, Vt.; Blanche B. Bryant, Springfield, Vt., administratrix of said William LeRoy Bryant, deceased. Patent 1,827,967.

Wheelhead and the Like. William LeRoy Bryant, Springfield, Vt.; Blanche B. Bryant, Springfield, Vt., administratrix of said William Le Roy Bryant, deceased. Patent 1,827,968.

Press for Sheet Metal. Charles Joseph Rhodes, Wakefield, England. Patent 1,828,201.

Grinding Apparatus. Wallace N. Appleton, Crafton, Pa., assigned to The McKay Co. Patent 1,828,212.

Metal-Working Machine. Lora E. Poole, Anderson, Ind., assigned to Delco-Remy Corporation. Patent 1,828,379.

Grinding Machine. William J. Baumberger, Davenport, Iowa, assigned to Micro Machine Co. Patent 1,828,384.

Grinding Machine. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,828,387.

Roller Spun Metal Manufacture. William R. Harrison, Massillon, Ohio, assigned to The Spun Steel Corporation. Patent 1,828,464.

Work Supporting Mechanism for Grinding Machines. Warren F. Fraser, Westboro, Mass. Patent 1,828,530.

Buffer or Grinder. William A. Marschke, Indianapolis, Ind., assigned to Marschke Manufacturing Co. Patent 1,828,540.

Automatic Grinder Control. Konrad Rupprecht, Berlin, Germany, assigned to General Electric Co. Patent 1,828,622.

Tools and Attachments

Tube-Flanging Tool. Edward S. Cornell, Jr., Watertown, Conn., assigned to The Chase Companies, Incorporated. Patent 1,827,733.

Turning Machine Chuck. Jarius S. Richardson, Sheboygan Falls, Wis., assigned to Mattison Machine Works. Patent 1,827,763.

Device for Grinding External Cylindrical Surfaces. Marsden C. Hutto, Detroit, Mich., assigned to Hutto Engineering Co. Incorporated. Patent 1,827,789.

Collet. Milton J. Matthews, Detroit, Mich. Patent 1,827,795.

Power Hammer. John H. Meeker, Somerville, N. J., and Eric K. Skonberg, Brooklyn, N. Y. Patent 1,827,877.

Tube-Flanging Tool. Edward S. Cornell, Jr., Watertown, Conn., assigned to The Chase Companies, Incorporated. Patent 1,827,882.

Method and Tool for Lapping or Honing. Frederick W. Roebbel and Harry E. Rogers, St. Louis, Mo. Patent 1,828,074.

Hydraulic Gear Puller. James E. Lynch, Texarkana, Tex. Patent 1,828,252.

Stud Setter. Alonzo Galloway Decker, Baltimore County, Md., assigned to Black & Decker Manufacturing Co. Patent 1,828,523.

Feed Mechanism. James F. Williams, Lyndhurst, and Raymond H. Cramer, Newark, N. J., assigned to General Motors Corporation. Patent 1,828,552.

Feeding Mechanism. Robert C. Danly, Chicago, Ill., assigned to Danly Machine Specialties, Incorporated. Patent 1,828,595.

Feeding Mechanism. Robert C. Danly, Chicago, Ill., assigned to Danly Machine Specialties, Incorporated. Patent 1,828,596.

Feeding Mechanism. Robert C. Danly, Chicago, Ill., assigned to Danly Machine Specialties, Incorporated. Patent 1,828,597.

TRADE PUBLICATIONS

AIR PAINTING EQUIPMENT. The Paasche Airbrush Co., 1909-1923 Diversey Parkway, Chicago, Ill., has issued Catalog E9-31 entitled "Air in the Automotive Industry," describing automobile, truck and accessory air-finishing equipment. All items are illustrated and the prices are listed.

CAPACITOR EQUIPMENT. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has published Leaflet 20044-F, covering group-type capacitor equipments for power-factor correction on 60-cycle circuits, as used for loads smaller than synchronous condensers will handle economically.

CHAIN DRIVES. The Morse Chain Co., Ithaca, N. Y., has issued bulletin R-50 on the new Morse roller chain joints and chains and giving dimensions and prices. Design data and sprocket information are included.

ELECTRIC CONTROL UNITS. The Allen-Bradley Co., Milwaukee, Wis., has issued Bulletin 375 on slip-ring drum speed regulators and Bulletin 800 on push buttons and accessories.

DRIVES, SHORT CENTER. E. F. Houghton & Co., Philadelphia, Pa., has issued a 148-page catalog entitled "VIM Short-Center Drives," which is a belt treatise compiled by its engineering research staff, and contains charts, tables, and engineering data on 5,000 standard drives ranging from 5 to 100 hp. The book was originally published for use by the company's technical field men, to assist them in discussing and working out transmission problems with engineers.

FURNACES. The General Electric Co., Schenectady, N. Y., has issued a bulletin on electric furnaces of direct-heat, metallic-resistor type. Box, car, elevator, conveyor, and other furnaces are illustrated and described.

GRINDERS. Cincinnati Grinders Incorporated, Cincinnati, Ohio, issued Bulletin FG-246 entitled "Cincinnati 20, 24, 28, 32 and 36-in. Roll Grinding Machines," being a 20-page catalog giving complete descriptions and specifications, together with illustrations of all units. It also calls attention to the benefit of finishing and reconditioning rolls by grinding.

TUNGSTEN-CARBIDE TOOLS. Metal Carbides Co., 361-367 Jelliff Ave., Newark, N. J., has issued Catalog No. 31-7 on "Talide" standard general-purpose tools and blanks. These tools use tungsten-carbide inserts.

TOOTH LOADS FOR BEVEL AND SPIRAL BEVEL GEARS

N = No. teeth in pinion
PD = Pitch diam. of pinion
R = r.p.m.
V = Velocity at PD — ft./min.
S_t = Static stress — lb/sq.in.
S = Running stress — lb./sq.in.
AF = Active face
Y = Outline factor (Table 2)
$D.P.$ = Diametral pitch
$C.D.$ = Cone distance
$hp.$ = Horsepower to be transmitted
W = Tangential load at PD — lb.
$M.F.$ = Material factor
$S.F.$ = Service factor

FOR SPIRAL BEVELS

$$V = 0.262 \times P.D. \times R \quad \ldots\ldots (1)$$

$$W = \frac{hp. \times 33{,}000}{V} \quad \ldots\ldots (2)$$

$$W/1\text{-in. } AF = \frac{W}{AF} \quad \ldots\ldots (3)$$

Note:

$$\text{Max. } W/1\text{-in. } AF = \frac{470 \times \sqrt{N}}{\sqrt{D.P.}} \times M.F. \times S.F. \text{ (Table 1)}$$

For Straight Bevel Gears, Use 80 per cent of above value

$$S = \frac{W \times C.D. \times D.P.}{(C.D. - A.F.) \times A.F. \times Y} \quad \ldots\ldots (4)$$

$$S_s = S \times \frac{1{,}200 + V}{1{,}200} \quad \ldots\ldots (5)$$

Available horsepower is dependent upon the materials from which the gears are made and service conditions under which they will operate. Values in Table I are based on use of case-hardened steel for both members. Material Factors for other combinations of materials are: soft steel pinion — cast iron gear 0.33; case-hard. steel pinion—heat-treated steel gear 0.50.

The type of service under which the gears operate is one of the principal factors in determining load capacity. It is essential to know continuity of maximum load, probability of shock, duration of overloads, and method of lubrication. Suggested service factors for various installations are listed here, but may, of course, be varied where experience indicates. Load values given are based on: Continuous operation at rated load without shock, 50 per cent overload at starting, 50 per cent momentary overload, proper assembly in rigid mountings, good lubrication, and static stress not exceeding two-thirds ultimate strength of material. Service factor is unity (1) in drives for: tank agitators, air separators, baking machinery, blowers and fans, centrifugal extractors, rotary coal dryers, cloth cutters (check static stress), coal and rock screen drive, glass making machinery, belt-drive machine tools, motor boat, printing machinery, coal and cement pulverizers (on overload basis), centrifugal pumps, speed reducers, textile machinery, washing machines, and woodworking machinery. Service factor is 0.75 for: air compressors, portable electric tools (check for high torque at low speeds), mining machinery, pneumatic tools, well-drilling and wire-drawing machinery. Factor is 0.65 for: dredging machinery, direct motor-drive machine tools, reciprocating pumps. Odd service factors are: airplane and airship 1-1.5; coal and rock crushers 0.5, conveyors 0.65-1, hoisting machinery 1-1.3, intermittent belt-drive machine tools 1.3, motorcycle 2, paper machinery 1.3 (based on starting torque), railway motor cars based on starting torque 2 and on normal running load 0.5, road machinery 0.65-1, rolling mill 0.5-.75.

Table I—Maximum Allowable Wear Load Values (W/1" A.F.) Spiral Bevel Gears

Teeth in Pinion	Diametral Pitch									
	1¼	1½	2	2½	3	4	5	6	8	10 and Finer
8- 9	1085	1005	939	838	766	674	594	537	471	421
10-11	1215	1125	1050	937	856	752	664	600	526	471
12-14	1332	1230	1149	1026	937	825	727	657	576	516
15-18	1482	1374	1284	1144	1050	911	813	739	643	575
19-23	1772	1545	1444	1294	1180	1023	915	834	724	645
24-29	1875	1740	1620	1449	1323	1154	1025	937	813	724
30 & up	2100	1942	1815	1620	1482	1288	1150	1047	909	810

For straight bevel gears use 80% of above values.

Abstracted from recommended practice of the American Gear Manufacturers' Association for "Computing the Allowable Tooth Loads and Stresses in Bevel and Spiral Bevel Gears, Industrial Installations."

TABLE II—"Y" Factors—Spiral Bevel Gears

Number of Teeth in Pinion	RATIOS														
	1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 to ∞
5	.297	.322	.343	.361	.376	.388	.398	.406	.411	.416	.420	.424	.431	.438	.450
6	.310	.332	.353	.372	.386	.398	.406	.414	.419	.424	.428	.431	.436	.443	.452
7	.318	.333	.347	.360	.373	.384	.392	.398	.405	.410	.415	.419	.426	.432	.439
8	.298	.320	.336	.348	.357	.366	.373	.379	.384	.388	.392	.394	.397	.400	.405
9	.292	.313	.327	.338	.346	.352	.357	.363	.367	.370	.373	.376	.380	.384	.388
10	.315	.338	.353	.363	.371	.345	.326	.342	.351	.357	.363	.367	.371	.374	.377
11	.316	.335	.348	.825	.327	.333	.338	.344	.350	.356	.361	.367	.375	.384	.390
12	.298	.318	.333	.343	.351	.357	.363	.368	.372	.377	.379	.381	.384	.386	.388
13	.302	.320	.334	.343	.351	.358	.365	.371	.376	.381	.884	.386	.388	.391	.393
14	.306	.322	.334	.345	.354	.362	.369	.374	.378	.382	.386	.389	.391	.393	.395
15	.314	.330	.342	.352	.360	.368	.374	.380	.385	.389	.392	.394	.397	.399	.402
16	.322	.335	.347	.358	.367	.374	.381	.386	.390	.394	.397	.400	.402	.404	.406
17–18	.329	.343	.354	.364	.373	.382	.389	.394	.398	.400	.403	.406	.407	.409	.410
19–21	.339	.351	.362	.373	.382	.389	.396	.401	.405	.407	.410	.411	.412	.414	.415
22–25	.351	.363	.373	.382	.391	.398	.403	.407	.410	.412	.413	.414	.415	.417	.418
26–30	.364	.374	.384	.393	.399	.404	.407	.410	.412	.414	.415	.416	.417	.418	.419

Straight Bevel Gears

10	.231	.260	.280	.294	.305	.315	.324	.332	.340	.347	.353	.358	.365	.371	.377
11	.268	.264	.273	.286	.296	.303	.309	.315	.320	.324	.328	.332	.336	.340	.342
12	.248	.265	.281	.295	.308	.318	.328	.335	.341	.345	.348	.351	.353	.355	.356
13	.264	.278	.291	.280	.278	.296	.291	.295	.298	.299	.301	.303	.305	.307	.310
14	.242	.254	.263	.272	.281	.288	.294	.299	.304	.307	.310	.313	.316	.318	.319
15	.248	.258	.266	.274	.283	.290	.296	.301	.305	.308	.312	.315	.318	.319	.320
16	.252	.261	.269	.277	.285	.292	.298	.304	.308	.312	.314	.317	.319	.321	.323
17–18	.257	.265	.273	.281	.288	.295	.302	.307	.311	.315	.318	.320	.322	.325	.326
19–21	.265	.272	.279	.286	.294	.300	.307	.312	.317	.320	.324	.326	.328	.330	.332
22–25	.274	.281	.288	.295	.301	.307	.314	.319	.324	.327	.331	.332	.335	.337	.338
26–30	.284	.291	.297	.304	.310	.317	.322	.327	.332	.336	.339	.342	.344	.346	.347

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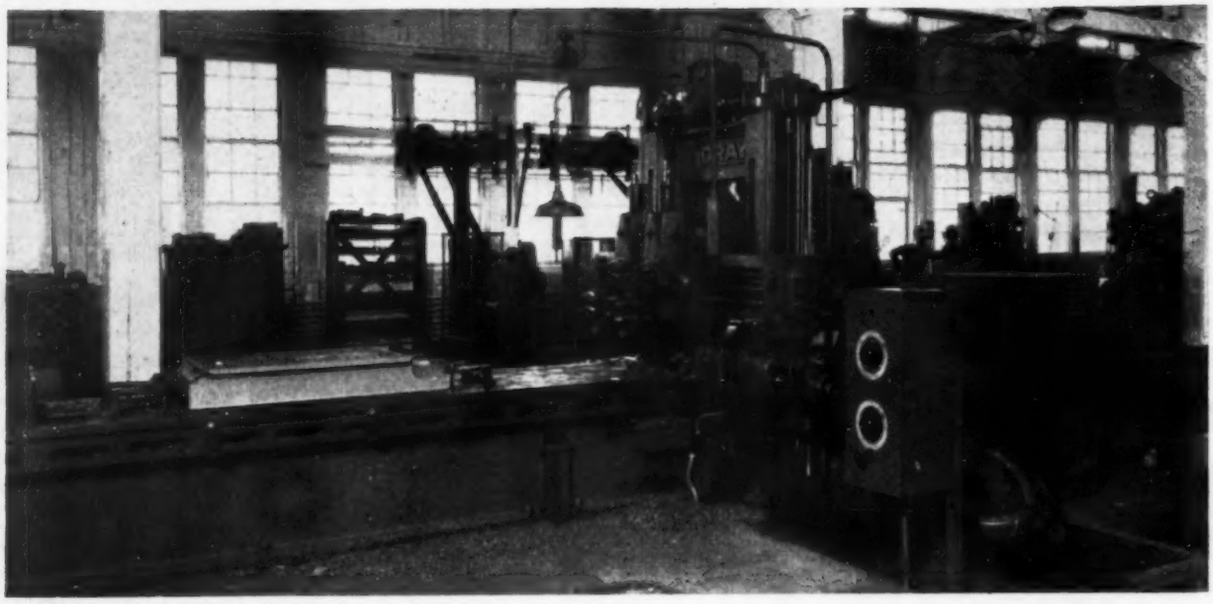

High-Speed Planers

PHELAN MC SHANE

General Engineer,
Westinghouse Electric & Manufacturing Company

THE ponderous old planers, cutting at 40 ft. per min. and returning at 80, are a far cry from the powerful motorized machines in common use. These new units are not only capable of faster cutting speeds than their more deliberate predecessors, but are specifically designed for the work they are to perform, lessening the time-wasting compromises of old-time planer operation.

When the reversing motor was first installed on a planer, it was simply applied to existing planer designs without change except for the removal of the tight and loose pulley assembly. Application of the motor was a decided improvement, for cutting speeds as low as 25 ft. per min. were obtainable for machining hard materials, while cutting speeds of 50 ft. per min. and return speeds as high as 100 ft. per min. were common. In addition the machines were capable of taking heavier cuts.

But larger planers and improvements in cutting tools called for still greater speeds. As a result the cutting speed was stepped up to 75 ft. and the return to 120, giving birth to the so-called 6:1 ratio motors. More recent developments in cutting tools have permitted a still further increase in cutting speeds, so that a change in gear ratio has been made to give cutting speeds varying from 30 to a maximum of 180 ft. per min. The planers illustrated are among the world's fastest at the present time; they have the 30-180 ft. per min. cutting speed range, as well as a return speed of 210 ft. per min. They incorporate constant-voltage electric motor drives.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, October 29, 1931

VOL. 75 NO. 18

Uptown and Up

For the seventh time in fifty-four years *American Machinist* has moved. Uptown it has come by leisurely steps from its birthplace at 96 Fulton Street, New York, to 207 Broadway, 256 Broadway, 218 Rose Street, 63 Park Row, 505 Pearl Street, 475 Tenth Avenue, and it now finds itself high up on the twenty-seventh floor of the new McGraw-Hill Building, 330 West 42nd Street.

We are proud of our new headquarters. Our position at the virtual hub of the nation's business should and will inspire every member of the staff to higher and more genuinely helpful publishing ideals. We hope that every friend of *American Machinist* will accept our cordial invitation to visit us in our new home.

Saving at the Spigot

Economy programs all too frequently overlook worthwhile opportunities for real saving. They are too likely to be directed at the point where the least saving is possible—direct labor. One large automobile builder, for example, is reported to have prepared dies for nearly fifty different body lengths for the coming season. It is difficult to imagine a need for half this number.

One of the justifications for large corporations consists in their chance to simplify and standardize product. That these economies fail to materialize in all cases is indicated by the large number of dies mentioned. These dies not only tie up capital; they add to the cost of tool storage and maintenance as well as making it more difficult to buy sheets to the best advantage. In too many large corporations, economies are confined to production costs. There seem to be far greater opportunities in simplification of design and in distribution.

Flexibility

Current business conditions have shown clearly, even painfully, the vital necessity of flexibility in the financial structure. The individual who is buying a home and paying for it out of income is finding to his sorrow that the interest on the mortgage remains fixed, and that the payments on principle are almost equally rigid. The railroads are in much the same fix because they have generally been able to secure capital only through bond issues instead of through the common stock sales which have been the recourse of many other industries. Dividends can be cut far more easily than bond interest. Any rigid financial charge, therefore, is a terrific handicap when income is seriously reduced.

Labor, through the trade union, is suffering from a somewhat similar sickness. When a man learns a trade and throws in his lot with a union in that trade he burns his bridges behind him. He is committed to that particular trade unless he possesses the ambition and skill to rise from it to executive positions.

But if a trade, through no fault of its own, loses its position in industry, what of its members? What would happen to the house carpenters, for example, if there should suddenly be a strong trend toward steel framing of dwellings? Or to plasterers if plaster board or some similar material should be universally substituted for plaster? Welding has already cut deeply into the work formerly done by molders in the foundry.

Jurisdictional disputes have been one of the serious evils that have undermined the trade union movement. They demonstrate the inflexibility of the labor union very clearly. Probably there are still enough reactionary employers in existence to make labor unions necessary for the protection of workers, although the need is diminishing with

the years, but certainly there is nothing to be said in favor of the type of labor leadership that permits a jurisdictional dispute to harm the members of the union, the employers and the general public.

If our economic leaders must discover means to make our financial structure more flexible, then surely the leaders of labor must find a way to introduce flexibility into the fabric of rules and regulations that are such serious handicaps to some industries. Otherwise the whole union movement seems doomed to vanish as have other activities, industries or companies that could not adjust themselves to changing conditions.

We live in rapidly changing times. Two years ago we admitted this but imagined that the only change to which we must accommodate ourselves was growth and expansion. Now we know that contraction is equally important as a form of change for which we must be prepared. Flexibility of structure, or organization, of ideas is the only means to success.

◂◂ CHIPS ▸▸

President Hoover and Premier Laval have had their conversations and made their statements . . . weeks may pass before concrete results appear, but our sincere welcome to the distinguished French statesman is already being reflected in increased French good will . . . More important still is the virtual collapse of the French bear raid on the American dollar . . . Irving Fisher Index of business condition hits 104, highest since last November . . . National Credit Corporation swings into action, and banks show increased confidence . . . That bank depositors were slipping fast away is shown by the new high of 461,000,000 dollars in postal savings against 200,000,000 less than one year ago . . . Farrell and Schwab both foresee upturn in trade . . . Railroad rate situation seems in fair way to be settled quickly.

Now that the British elections are out of the way, Europe can get down to business . . . At that, England repays 100,000,000 dollars in advance on her 125,000,000 pound stabilization account . . . And Bruening's victory inspires Germany to even better business . . . Reported that the U.S.S.R. considers debt moratorium of its own . . . Machinery and machine tool builders please note . . . Grandi, Italian foreign minister, prepares to follow Laval to our shores . . . Canada forbids exports of gold except by due license . . . The League of Nations faces its first real test of strength in its ultimatum to Japan . . . Now apparent that the U. S. State Department's policy is dictated by fact that China is virtually the last "free market" for American goods . . . A vast open market for all industrial nations is at stake.

> I came to America expecting to see a badly depressed country, but I am agreeably surprised. From what I have seen you are still quite prosperous. Business, of course, is quiet, but nevertheless there is quite a considerable volume. With the amount of business you are doing, your surplus wealth, your technical and executive brains, and all the other factors operating in your favor, I must say that I am surprised at the amount of pessimism I find, both in the United States and in Europe, concerning the future of this country. —André Citroen.

Ernst & Ernst analysis of 162 industrial balance sheets discloses improvement in average liquid position . . . current ratios 6.93:1, 1931; 5.49:1, 1930; 4.73:1, 1929 . . . inventories show decrease of 26.65 per cent . . . Westinghouse Electric orders capacity refrigerator operations for 1932 . . . Corona Typewriter is giving full time employment . . . New England Telephone and Telegraph increases profits over last year . . . Airship "Akron" accepted by Navy . . . Order for sistership confirmed . . . War Departments orders five low-winged Lockheeds from Detroit Aircraft . . . 166,332 dollars . . . Navy awards 463,700-dollar contract to Berliner-Joyce Aircraft . . . eighteen two-seater observation planes . . . International Projector Corporation running overtime three nights per week . . . Oil-O-Matic heater sales gain 21.2 per cent . . . C.M.St.P.&P. R.R. recalls 1,000 men to its West Milwaukee shops . . . Chrysler earns 1,500,000 dollars in third quarter, against a loss last year . . . Chevrolet resumes Saginaw foundry operations . . . 3,200 men affected . . . Warren Telechron steps production up one third . . . likewise employment . . . Budd Wheel receives one contract for 750,000 wire wheels.

George W. Moore Company merges with H. W. Caldwell & Son Company, Link-Belt subsidiary . . . Max H. Hurd, formerly president of Moore, becomes a Link-Belt vice president . . . Hupmobile moves production of sixes from

bodies in Cleveland . . . Burroughs Adding Machine invades standard typewriter field with new model . . . D. R. Campbell Machine Company, Dorchester, Mass., extends plant and adds employees . . . Niagara Falls union bricklayers and stone masons actually request cut of two dollars per day, from twelve dollars to ten . . . they were not turned down . . . N. E. Wahlberg, Chief engineer of Nash Motors, is elected vice president in charge of engineering . . . The Hardinge Brothers, Inc., completes transfer of offices and factory from Chicago to Elmira, N. Y. . . . Western Cartridge acquires Winchester.

ANOTHER SPECIALIST

One of the executives of an engineering firm was naturally pretty flustered toward the end of a day spent with movers transporting his furniture from one set of offices to another, and his irascibility was probably excusable during the struggle to get a large, heavy antique table out through the door of the committee room. All the moving men were attacking it, all save one who leaned against the wall watching with interest and, one might suspect, mild enjoyment. "Why don't you give a hand?" demanded the engineer. The mover just looked tolerant. "I'm a metal man," he explained.

—THE NEW YORKER.

Ask us—we too have just moved.

THIS WEEK IN *AM*

Almost as continuous as revolutions in South America are the private industrial wars waged for new machinery and equipment. No plant executive can consider that he has won his spurs until he has emerged victorious from at least one pitched battle with his board of directors. But winning the battle is only half; the executive must keep the board sold for continuing appropriations. And the leading article in this issue shows how the plant management of one outstanding machine tool builder did the job. "Modernization Through Visualization" is based on the new use of one of the most telling principles in human relations.

You will remember that we have seen Soviet Russia through the eyes of Messrs. Polakov and Carmody, a naturalized American and a native American. In the opinion of many readers, they presented clearer pictures of things as they actually are than have any of the recent observers and commentators. This time a contributor presents other angles of the same picture, taken from a European point of view. "American Engineers vs. Russian Shrewdness" (page 661) expresses the findings of an equally shrewd Berliner.

"New Inventions in Gaging" (page 657) represents timely research and a new method of grouping new patents for your convenience. We shall be interested in receiving your comments and suggestions. "Eliminating Lost Motion Between Jobs" (page 664) should not be overlooked by any executive or operative. Heat-treating and stamping go hand in hand in "Some Lincoln Methods" (page 670). "Precision Measuring Instruments" (page 666) carries forward a series which will act as an eye-opener for many Americans. If you are not fully aware of the advances in modern planer drives, turn to "High Speed Planers," just over the leaf from the Reference Book Sheet, on page 688.

COMING

If you will turn the wheels of your memory back to the budding month of May you will recall the announcement of a contest for the *American Machinist* Awards for 1931. Through June the entries continued to come in, some of the more belated ones being delayed until the first week in August. Then came the briefs themselves, and the preliminary studies to determine the four outstanding replacement policies in metal-working plants whose average output is one million dollars or more, and the four from plants whose output is under one million. Right up until Monday of last week the five members of the Committee on Awards have been sifting, checking, comparing to determine the two winners. The decisions have been made. The plaques, the certificates and the purses of gold will be presented during the evening of November 12, and the two winning briefs will be published in full in the *American Machinist* of the same date.

You will not have quite so long to wait for the issue of November 5. In it will positively be published "Standardization by Preferred Numbers," one of those rare articles which takes a somewhat abstract subject and makes it practical. "Tool Economy Through Adjustability" will show how one company saved itself a huge die investment through what was at one time considered an impossibility. Another article will show how to keep down die costs by means of hard facing; still another will complete the series on German precision measuring instruments. Not less interesting will be a description of certain developments in generating worm gears.

THE . INDUSTRY .

Progress in Metal-Working and Machinery Markets

OCCASIONAL indications of betterment are noted, but by and large the situation is unchanged from last week. . . . Most of the buying is being done by the Federal Government and its departments; school buying seems over for the year, and municipal governments share the seeming apathy of industry. . . . It is the consensus that prospects are more interested than they have been through the summer, but that future prospects depend entirely upon some development in the business situation.

NEW YORK reports a total of around $50,000 from Lycoming, a continued hold-up on the orders for subway equipment, and a few government sales. . . . Industrial demand is lacking, used tools do not go even at sacrifice prices, and inquiries, with one exception, are unchanged. . . . Cincinnati also has one source of cheer in inquiries, another in orders, but the great proportion of builders and dealers there have noted no change. . . . New England has an automobile list, Government lathe orders, some hope of foreign business, and the possibility that the Government will take still more. . . . San Francisco also has sold some tools to the Government and has some hope for the near future.

CHICAGO feels optimistic, but has little to back it except increases in small-tool sales. . . . Detroit is making some sales to tool and die shops and expects to sell automobile builders when and if the new models take hold late this fall . . . . Indianapolis reports dealers in small tools best situated, sales being to small machine shops, airports, radio builders, and other ordinarily minor sources. . . . Canada is selling some tools to automobile, gold mining, and small manufacturing plants; other sources show little interest.

NEW YORK

No change worthy of mention has occurred in the New York market. With one or two dealers, the week was a little better in orders and inquiries, but most of what little business is being placed comes from the Government. Lycoming released orders for some drills, some turret lathes, and some milling machines, the total to run about $50,000 to $60,000, largely for fill-in purposes on the previous $325,000 order. Final orders have not been released on the Subway job; there are indications that all is not well with the inquiry.

CINCINNATI

One manufacturer reports a slight pickup in business and another reports a slight increase in inquiries. Other manufacturers find business merely dragging along the bottom as it has been and see no indication of immediate improvement. Local selling agents are getting an occasional order and developing a prospect here and there. Most of the business booked came from general machinists and miscellaneous users whose requirements were single tools for replacement.

NEW ENGLAND

The market has but few encouraging features, with orders for the most part small and of no great importance. A new list from an eastern automobile manufacturer indicates promise for turret lathe and milling machinery builders. New lathe orders have been received from the government, but more important lists are yet to be acted on. New foreign construction plans have revived expectations and created new promise in Massachusetts centers. Aside from a slight improvement in the distribution of small tools, nothing approaching progress has been made.

SAN FRANCISCO

There is some definite optimism among dealers, and a member of one of the most conservative and reliable firms states that the horizon is brighter. Several milling machines, turret lathes and punch presses have been sold during the past month, and a number of good prospects are ahead. The United States Government is still the best purchaser. A large supply of paper-cutting machinery is en route for stock, which indicates the faith local dealers have in future business. Road-making machinery sales are not as numerous as expected, and distributors of conveying machinery are simply marking time. A recent reduction in marine westbound rates had caused a slight increase in the movement of miscellaneous machinery.

CHICAGO

Definite indications of a more cheerful outlook are noted. Manufacturers' representatives and distributors feel an optimism lacking for some time past. This is not attributed to an increase in inquiries reported, nor to the closing of sales, which is as backward as for the last several months. Nevertheless the feeling exists, and is generally expressed, that it will not be very long now before the upturn. Several factors are pointed to as warranting this forecast, among these a renewal of confidence on the part of general industry, and the necessity for increased production as seasonal demand rises. The sale of accessories, small tools and repair parts shows improvement.

DETROIT

The situation is unchanged. Few sales have been made during the last ten days, and few are expected in the near future. Dealers will make no predictions as to November and December sales. Automobile manufacturers are convinced their plants will be busy until February and that general conditions will be better than during the last six months. This does not indicate that the equipment dealers will receive any benefits, however.

Tool and die shops continue to employ men and are now the brightest spots as far as machinery and tool dealers are concerned. Small shops are making occasional purchases and may be required to make still more if they are to keep pace with the demands of automobile plants.

INDIANAPOLIS

Some leaders see slight improvement in demand, though volume is low and likely will continue at a low point until the turn of the year. It seems the dealers in small tools are best situated. The last two weeks have seen quite a volume of small items sold to garages and similar businesses. Machine shops also are buying to some extent, mostly for replacement. An increasing number of airports and enlargement of facilities is creating quite a demand for equipment. Demand for special machinery for the radio trade is seen. Steel trade demand continues dull, as does railroad demand. There are no lists out in the local market, and the trade expects little from these sources for some time.

CANADA

A check-up reveals that most machinery and equipment being sold at present is going to three chief groups—automobile plants, gold mining companies and small manufacturing concerns. The larger manufacturing plants, while showing some progress during the last fortnight, are still operating much below capacity. The steel trades are slow, and production of agricultural implements is on a greatly reduced basis. Two of the country's leading steel mills in the Sault Ste. Marie district have been closed down indefinitely.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

The coming of Pierre Laval, Premier of France, who is in Washington to discuss with President Hoover "the crisis which unsettles the world and undermines the morale of nations," emphasizes the important change in the outlook which has come about since last Autumn when the belief was general that the business ship somehow would manage to drift back to normal. Today not only have we more statesmanlike leadership but a more mobile public opinion which presages a willingness to approve and follow that leadership if directed toward worthwhile accomplishments. Such a mobilizing of man-power for aggressive action is capable of moving mountains, and in view of the depth to which the deflationary movement has been pushed, might easily disperse the clouds which still obscure the national and international business horizons.

The world therefore will await with keen interest the results of the discussions now under way at Washington where the leaders of the two great nations which have maintained the gold standard will consider ways and means of co-operating so as eventually to lead the world into a saner attitude on debts, armaments and relief from economic ills. The results of these deliberations will not be, of course, to solve the world's economic problems. But if they establish a basis of mutual understanding in the approach to these problems they will have accomplished their purpose and have rendered the world an incalculable service.

Important Developments

Developments of the week have been of unusual importance from an economic standpoint. The Interstate Commerce Commission, while refusing the petition of the railroads for a flat increase of 15 per cent in freight rates, would permit increases on certain commodities, including steel, pig iron, scrap, machinery, iron ore, coal and coke, providing the carriers form a pool to protect the position of their weaker brethren. While presidents of the nation's leading roads, in executive session at Atlantic City, favor modification of the Commission's proposals, they have expressed their earnest desire to co-operate with the government in its purpose to stabilize railroad credit.

News that the Bank of England had retired four-fifths of the $125,000,000 credit advanced by our Federal Reserve system on Aug. 1 for the defense of the pound sterling came as a pleasant surprise to Wall Street and augurs well for the early stabilization of sterling exchange. Trepidation over the withdrawal of gold by those having credit balances here is subsiding. The Federal Reserve Bulletin for October reports that the decrease of $370,000,000 in monetary gold in the United States between Sept. 19 and Oct. 7 did not result in a substantial change in the amount of free gold at the disposal of the Federal Reserve system, by reason of the fact that eligible paper was substituted as collateral for notes.

The National Credit Corporation, organized to thaw out frozen bank loans, has formally started operations whose effects are expected to prove salutary not only in decreasing necessitous liquidation of bonds from institutional sources but in curbing unwarranted and unnecessary deposit withdrawals from sound banks. Bank suspensions in September totaled 298 for the country at large, the second largest monthly number on record, but it must be remembered that so far this year the total number of such suspensions has been a very small percentage of the whole.

Increasing Resistance

Both stocks and commodities show increasing resistance to bearish news with a growing disposition to advance on the strength of constructive developments, as well they might considering the bargains currently being advertised in the market places. The building outlook is reported as somewhat improved, and the steel market reviews are becoming more hopeful. Carloadings show a small decline from a week ago, but a gradual improvement from now on is anticipated. Shoe consumption continues brisk, and reports at the annual meeting of the Cotton-Textile Institute stated that the outlook for increased consumption of cotton goods appear bright. While we are averse to "over-prediction," it may be significant that shoes and cotton goods were among the manufactured products which led the way out of the last major depression.

On the surface, the Manchurian situation seems to be extremely precarious. Japan refusing to accept a time limit on the withdrawal of her troops to the railway zone allowed by treaty and insisting on direct negotiations with China as an antecedent to their withdrawal. China also is not altogether pleased with the League's move toward decided action. It is probable, however, that the objections of both sides are motivated largely by a desire to "save face" and that the situation is less serious than it appears to be.

In this country the campaign for relief of the unemployed has made a satisfactory start. The total amount needed during the next twelve months for this purpose is estimated by the Association of Community Chests at $170,090,130.

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THE BUSINESS WEEK

October 28, 1931

All the crucial questions requiring large-scale constructive action to speed recovery remain in a state of suspension this week. . . . Emergency remedies applied to the banking situation and offered to the railroads by the rate decision, as well as provisional arrangements that have improved the European political and financial picture, have temporarily relieved the tension and put the patient in a more comfortable position, pending further consultation by the doctors on the advisability of more drastic operations. . . . The stock market has steadied itself under stringent regulation and in expectation of further stimulation from official action; but the bond market continues weak under the abnormal pressure of higher money rates. . . . Most encouraging among the reaction to developments of recent weeks is the strengthening of key commodities, probably in anticipation of ultimate inflation as the only exit from our economic dilemma. . . . Slight symptoms of scattered business improvement have appeared in some localities and special lines, but these are not yet reflected in the figures. . . . Our index has relapsed to a lower level, but still holds above the deadline of 70% of normal that seems to have established the limit of business decline in this depression. . . . Continued increase in outstanding currency, further bank suspensions and gold losses indicate that the breach in confidence in our credit mechanism has not been closed by measures so far taken.

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Material Trends and Prices . . . .

The most active section of the steel market at present is undoubtedly that for ship, car and tank plates. Automotive material is in second place, while structurals appear to be slowing down a bit, so far as buying is concerned. Inquiry continues light in both tin and zinc but there is marked improvement noted in demand for copper. Smelteries, closed during the summer because of low prices of metal, are said to be preparing to re-open in November. Betterment also is reported in lead demand.

(All prices as of Oct. 23, 1931)

IRON AND STEEL

	Current	Mo. Ago	Yr. Ago
Pig Iron —			
Birmingham, No. 2, Fdry., per gross ton	$11.00@$12.00	$12.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.50	14.50
Furnace Coke — Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes — Pittsburgh, base, per 100 lb.	1.60	1.60	1.60

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago	4.62½	Cleveland 4.50	New York 4.75
Cincinnati	4.40	Detroit 4.00	

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

*Light plates.

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches					
		½	⅝	¾	⅞	1	1⅛	1¼
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 73-10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn.	7.12½
Copper wire, base, Chicago and Cleveland	9.37½
Copper wire, base, N. Y.	9.25
Lead, pigs, E. St. Louis	3.82½
Tin, Straits, pigs, spot, N. Y.	22.87½
Zinc, slabs, E. St. Louis	3.30

Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:

Brass rods, high	11.25
Brass sheets, high	13.00
Brass tubing, high	16.25
Copper, drawn round	13.62½
Copper sheets	16.12½
Copper tubing	15.62½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	29.00
Babbitt, com'l, intermediate grade	34.75
Babbitt, genuine, highest grade	44.00
Solder, bar	18.00

Prices following are in cents per lb., base, Huntington, W. Va.:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

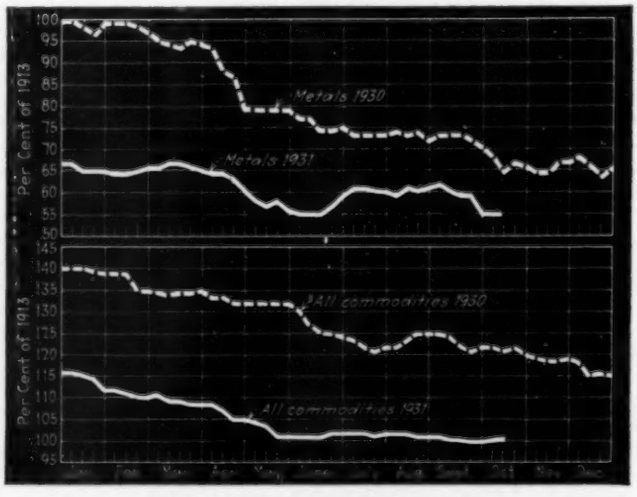
	New York	Cleveland	Chicago
Heavy yellow brass	2.50	2.50	2.25
Light brass	2.00	1.75	2.00
No. 1 rod-brass turnings	3.00	2.75	2.25
Heavy copper	5.00	4.00	4.00
Light copper	4.00	3.75	3.50

SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30-10%	40%	40%
Belting, rubber, trans., Grade 1	60-10-10%	60-10%	60%

Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:			
1x4-in.	$27.00	1x6-in.	$26.00
Skids-Spruce:			
2x4-in.	$37.00	3x4-in. $40.00	4x6-in. $42.00	6x6-in. $50.00



Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

NEWS

A.S.M.E. Announces Program For Annual Meeting

Honorary membership in the A.S.M.E. will be conferred upon DR. PALMER C. RICKETTS, Dec. 1, during the annual meeting Nov. 30-Dec. 4. Dr. Ricketts has been connected with Rensselaer Polytechnic Institute for 59 years, four as a student, forty as director, and the last thirty as president and director. The Tuesday evening event will also include an address by PRES. ROY V. WRIGHT, dealing with forward-looking plans of the society. On the same evening the various prizes will be awarded, including the John Scott Medals to WILLIS H. CARRIER, A. H. EMERY, H. T. HERR, and ALBERT KINGSBURY.

The Towne and Thurston lectures will be given at the annual meeting for the first time in several years. The Towne Lecture, which deals with the relationship between economics and engineering, will be given by DEAN W. B. DONHAM of the Graduate School of Business Administration, Harvard University. The Thurston Lecture will be delivered by DR. EDWARD L. THORNDIKE, Professor of Education at Teachers College, Columbia University, on "Psychology and Engineering." The committee on the Economic Status of the Engineer will report on the afternoon of Dec. 1 and the usual business meeting will also be held at that time.

The technical papers of interest to members of the metal-working industry are as follows:

Improved Device for Recording Instantaneous Tool Pressures in Machinability Studies, O. F. GECHTER and H. R. LAIRD.

Photoelastic Developments. (a) Kinematography in Photoelasticity, MAX M. FROCHT. (b) Photoelastic Study of Shearing Stress in Keys and Keyways, A. G. SOLAKIAN and GEORGE B. KARELITZ. (c) Celluloid as a Medium for Photoelastic Investigation, R. H. G. EDMONDS and B. T. MCMINN.

Rustless Steel Conveyors—Their Availability, Application, and Use, NIXON W. ELMER.

Application and Design of the Floating Drive for Conveyors, N. H. PREBLE.

Improved Material-Handling Methods in a Container Plant, H. N. MACDONALD.

Progress Report of Materials Handling Division, F. D. CAMPBELL.

Design of Spring Gears for Exhaust-Turbine Installation, J. ORMONDROYD and T. C. KUCHLER.

Compression of Rectangular Blocks and the Bending of Beams by Non-Linear Distribution of Bending Forces, J. N. GOODIER.

Forced Vibrations with Non-Linear Spring Constants, J. P. DENHARTOG and S. MIKINA.

Elements of Milling, O. W. BOSTON and CHARLES E. KRAUS.

Tungsten Carbide and Other Hard Cutting Materials, Progress Report No. 3 of Subcommittee on Metal-Cutting Materials, COLEMAN SELLERS, 3RD.

Machine-Design Management, J. L. ALDEN.

Correlation of Design and Foundry, ALEX TAUB.

Progress Report of Machine-Shop Practice Division, C. DEZAFRA.

Air Resistance of High-Speed Trains and Interurban Cars, O. G. TIETJENS and K. C. RIPLEY.

Stresses in Railroad Track, S. TIMOSHENKO and B. F. LANGER.

Optimum Conditions in Journal Bearings, ALBERT KINGSBURY.

Pressure Distribution in the Oil Films of Journal Bearings, S. A. and T. R. MCKEE.

Oil-Film Pressures in an End-Lubricated Sleeve Bearings, LOUIS J. BRADFORD.

Dividend Programs Related to Depreciation, E. G. FIELD.

Economic Life of Equipment, H. O. VORLANDER and F. E. RAYMOND.

Modern Oil-Lubrication Methods as Applied to Rolling-Mill Equipment, J. A. MERRILL and E. M. MAY.

Oil Requirments for Modern Rolling-Mill Circulating Systems, C. M. LARSON.

Leakage Loss and Axial Thrust in Centrifugal Pumps, ALEXEY J. STEPANOFF.

Turbulence in Centrifugal Pumps, JOHN W. MACMEEKEN.

Design Problems of Controllable-Pitch Propellers, W. B. HEINZ.

Coordination of Research and Engineering with Production and Sales CARL L. BAUSCH.

The Coordination of Research, Sales, and Production, RICHARD L. WILDER.

Straight Copper-Lead Alloys versus Solid-Solution Bronzes for Heavy-Duty Bearings, F. R. HENSEL and L. M. TICHVINSKY.

Millwright Bearings for Roll Necks of Medium-Sized Rolling Mills, K. W. ATWATER.

Water-Lubricated Soft-Rubber Bearings, W. F. BUSSE and W. H. DENTON.

Application of Celoron Bearings to Roll Necks, ARTHUR J. SCHMITT.

The Application of Tapered Roller Bearings in Merchant-Bar Mills, S. M. WECKSTEIN.

Foremanship Training, U. J. LUPIEN.

Modern Industrial Training, GEORGE SEYLER.

Steel Founders Report Upturn

Comparing September figures of the Steel Founders' Society of America, Inc., with those for August, an increase of 2.5 per cent is shown in the number of foundries reporting operations above 50 per cent. A corresponding increase in bookings is indicated, 2.2 per cent more foundries reporting new orders over 50 per cent of capacity. The present rate of operations in per cent of capacity shows a slight drop. Fourteen per cent of the foundries reporting indicated increases in numbers of inquiries received.

Following its seventh move in its fifty-four years of existence, *American Machinist* now finds its offices on the 27th floor of the new McGraw-Hill building, 330 West 42d St., New York City

Industrial Corporations Improve Liquid Position

Improvement in the liquid position of industrial corporations on June 30, 1931, over the mid-year showing of 1930 and 1929 is disclosed in an analysis and comparison by Ernst & Ernst, of the published balance sheets of 162 companies, in fifteen industrial groups and miscellaneous. In the aggregate, 162 companies raised their composite current ratio (current assets to current liabilities) from 4.73:1 as of June 30, 1929, to 5.49:1 as of June 30, 1930, and to 6.93:1 as of June 30, 1931. Net working capital decreased in that time from $2,320,914 to $2,106,349, a decrease of 9.24 per cent, while inventories decreased from $1,399,557 to $1,026,543, a decrease of 26.65 per cent in two years.

Telegraph Code Effective in November

Nov. 16 will mark the date of adoption of LCode, a telegraph code book including all words and phrases used in the purchase and sale of electrical equipment and supplies. The code contains five-letter code words covering expressions in every branch of the electrical field, compiled under supervision of the industry, and is of convenient size and arrangement. There is also included an ingenious arrangement of flexible phrase tables enabling one to reduce to one code word combinations of short words invariably used. This avoids ambiguity which so often occurs when words are eliminated to shorten messages. This is the first instance of an entire industry sponsoring a single standardized code, and it is calculated to effect not only large economies in money and time but a workable uniformity in terminology throughout every division of the business and art. The code book contains 265 pages, 7¾x10⅝ in., bound in fabricoid semi-flexible cover, including 193 pages of phrases, printed two columns to a page (about 34.000 phrases) and 72 pages of instructions, telegraphic information and tabular matter. The code book has been issued by the Business Code Co., New York City, or can be obtained through the National Electrical Manufacturers Association, 420 Lexington Ave., New York, N. Y.

George W. Moore Co. Joins Link-Belt

The merger of the George W. Moore Co., Chicago, with H. W. Caldwell & Son Co., a subsidiary of the Link-Belt Co., has been announced by ALFRED KAUFFMANN, president, Link-Belt Co. The combined units are to be known as The Caldwell-Moore Division, Link-Belt Co. MAX H. HURD, formerly president of the George W. Moore Co., becomes a vice-president of Link-Belt in charge of Caldwell-Moore operations, with headquarters at 2410 West 18th St., Chicago.

New England Conference Scheduled Nov. 19-20

The Seventh New England Conference, annual gathering of New England business men with the six New England governors, will be held this year Nov. 19 and 20 in Boston, according to an announcement by PRES. HARRY C. KNIGHT, of the New England Council. Official invitations to the commercial, industrial and agricultural organizations of New England to send delegates to the conference have been issued. The conference, first held in 1925 at Worcester, brings together business leaders of the six states each year to confer with the six New England governors on problems of New England's business and economic development.

New Directors of National Machine Tool Builders' Association

E. A. MULLER
President and treasurer
King Machine Tool Co.

S. OWEN LIVINGSTON
1st vice-president
Gallmeyer & Livingston Co.

Blank & Stoller

H. S. ROBINSON
Secretary and sales manager
Cincinnati Shaper Co.

Civil Service

Open competitive examinations for positions as associate metallurgist and assistant metallurgist, under the optional subjects of ferrous metallurgy, non-ferrous metallurgy, physical metallurgy, and ore dressing, have been announced by the United States Civil Service Commission. Applications must be on file with the commission at Washington, D. C., not later than Dec. 30. The examinations are to fill vacancies in the departmental and field services. Entrance salaries for associate metallurgist from $2,600 to $3,200 a year.

Dunn and Lee Head Simmons-Boardman

SAMUEL O. DUNN has been elected chairman of the board, and HENRY LEE president of the Simmons-Boardman Publishing Co., New York City, publisher of nine business papers, including *Railway Age* and *Railway Mechanical Engineer*. Both have been connected with the company for more than 25 years, Mr. Lee having been with the organization since 1905 and Mr. Dunn since 1907. At the same time, Mr. Lee was elected chairman and Mr. Dunn president of the affiliated American Builder Publishing Corporation and Mr. Lee was also elected president of the House Furnishing Review Co. Mr. Dunn will also continue his duties as editor of *Railway Age*, a position he has held since 1911.

Industrial Conferences At Case School

Announcement has been made of the principal portions of the program of the conference on Metals & Alloys scheduled for Nov. 18, 19 and 20, by the Case School of Applied Science, Cleveland, Ohio, and the Cleveland Engineering Society. (*AM*—p. 510h, Sept. 24). Dr. A. A. BATES will speak on the general subject of "Metallurgy of Alloying"; Dr. M. A. GROSSMAN, vice-president and director of Republic Research Corp., will speak on "Stainless Steels"; T. H. WICKENDEN, of the International Nickel Co., will speak on "Monel Metal and the Nickel Alloys"; W. R. HIBBARD will present "Brass, Bronze and Copper Alloys"; W. M. PIERCE, of the New Jersey Zinc Co., will speak on "Zinc and Its Alloys"; L. W. KEMPF, of the Aluminum Co. of America, will speak on "Aluminum and Its Alloys." Other ferrous alloys and nitrided steels will also receive attention. Dr. JOHN A. GANN, chief metallurgist of the Dow Chemical Co., will speak on "Magnesium Alloys." H. J. FRENCH, chairman of the Joint A.S.M.E.-A.S.T.M. Research Committee on Effect of Temperature on the Properties of Metals, will present a discussion and review of the symposium on this subject, held in Chicago during last summer. MR. MAGUALO, of Cross & Cross, will describe the rapid development in the use of metals and alloys in the construction and decoration of recent New York buildings, in a special session. C. H. BIERBAUM, vice-president of the Lumen Bearing Co.; Mr. GURNEY, of Warner & Swasey; R. R. MOORE, of the Wright Aeronautical Corp.; Dr. KARL ARNSTEIN, of Goodyear Zeppelin Corp., have also been invited to present papers.

In addition to the papers, a number of demonstrations will be presented, including a complete die-casting process, together with the special equipment and tests now being developed by PROF. H. D. CHURCHILL for research in this field; special X-ray equipment and demonstrations by Dr. KENT R. VAN HORN, of the Aluminum Co. of America, and by Dr. CHRISTIAN NUSBAUM.

Exhibits of testing apparatus, lightweight alloys, corrosion resisting alloys, wear-resisting alloys, hard alloys, alloys for architectural and structural use, will also be shown. There is no charge for exhibition space.

Changes in Tool Markets Shown By German Machine Exports

By Our Berlin Correspondent

Surveying the German metal-working machine exports for the first half year 1931, we can clearly distinguish two groups of countries: those which decreased their machine imports greatly as a result of the economic crisis; and those that endeavored to increase their own production. Among the first group are Great Britain, Switzerland, Sweden, Czechoslovakia, Denmark, Argentine, Austria, Belgium, Brazil, Holland, Hungary, Norway and Poland, while the latter comprises Russia, the United States, Japan, Turkey, Spain, Italy and France.

German Metal-working Machinery Exports

	January-June 1930		January-June 1931	
	Dollars	Tons*	Dollars	Tons*
Countries showing increasing imports:				
France	$4,413,000	10,380	$3,606,960	11,000
Italy	1,329,600	545	721,200	1,167
Japan	306,720	410	423,600	983
Spain	449,040	1,125	537,360	1,550
Turkey	47,520	187	242,400	856
U. S. A.	559,400	1,114	633,120	2,133
U.S.S.R.	4,510,000	7,070	7,239,840	13,050
Countries showing declining imports:				
Argentine	678,240	1,810	190,569	454
Austria	616,800	1,309	246,480	1,010
Belgium	1,371,840	4,760	420,720	1,273
Brazil	250,320	522	179,760	367
Czechoslovakia	1,238,400	3,055	763,680	1,625
Denmark	359,760	915	180,000	450
Great Britain	2,313,840	5,550	1,143,600	2,215
Holland	908,920	2,200	498,480	1,517
Hungary	320,400	840	143,040	423
Norway	241,680	538	134,880	284
Poland	261,120	406	181,920	331
Sweden	764,880	1,752	402,480	988
Switzerland	1,208,640	2,402	769,200	1,470

(*) Long tons = 2,240 lb.

In considering the Russian figures, one must remember that the tables compare the first six months of 1930 and 1931, while during the last six months of 1931 a change may occur in German exports owing to Russia's shifting part of its orders to France, Czechoslovakia, Italy, the United States and England, in view of bad German financial and credit conditions. The German price policy, which in Germany is attributed to cutting by the American competition, leads to the following interesting information: While the weight and bulk of exports to the U.S.S.R., the United States, Japan, Turkey, Italy, France and Spain rise by considerable percentages from 1930 to 1931, a glance at the values shows that some important changes have taken place. This reduction in value is visible especially in exports to France, to which country bulk exports rose during the first six months of 1931 by 640 tons as compared to the first six months of 1930, but the value dropped by some $804,000.

The second important group of German machine tool exports comprises wood-working machines. The difficult position of the international lumber market has caused a decrease of exports of such machines during January to June, 1931, to a total of 3,767 tons valued at $1,465,200, compared with deliveries during January to June, 1930, of 6,580 tons, worth $2,588,000, and 6,405 tons totaling $2,573,000 for January to June, 1929. If the American export values for the first five months of 1931 are taken for comparison, one can notice that the export drop of the American competitors compared to January to May, 1930, also amounts to about 55 per cent. All large customers for wood-working machinery reduced their orders this year excepting Yugoslavia, which increased its imports.

Steam, hydraulic and drop forge presses, riveting machines and power hammers were also exported by Germany during January to June, 1931, to a total of 2,273 tons, valued at $535,680, against 2,620 tons worth $568,080 in the first six months of 1930. The chief customers were the U.S.S.R., Great Britain, France, Mexico and Japan.

Let us view German exports to Turkey in particular, considering the figures in the accompanying table. Even though the value of exports in 1931 has only risen five-fold compared to 1930, and this must be looked upon as a deterioration against bulk exports, which rose from 87 tons to 856 tons (by almost 1,000 per cent), the result nevertheless is astounding, and Turkey must be regarded as an important country for machine tool exports. Germany is therefore developing a very active advertising campaign in that country, almost lost as a result of Turkey's hostility toward Germany after the war, regarded as the author of the economic downfall of the country. The main business in machine tools went to America. Turkish machine tool purchases in the United States, amounting to $6,936 in 1913, rose to $98,722 in 1921. Turkey ordered $260,000 worth of tools in Germany and Austria in 1913, but only $28,650 worth in 1921. Statistics for 1930 show American machine tool exports to Turkey to be about $27,950, while those of Germany and Austria reach $214,650. Conditions in other branches of machine construction and export to Turkey appear to be similar, and the table shows that Turkish preference for German machines during the first months of 1931 has been even greater than in 1930. Looking for the reasons, one must of necessity arrive at the following facts: As a cause of political conditions after the war, American manufacturers no doubt held a predominant position in the Turkish machinery imports. Partly because of negligence of Turkish importers, partly also as a result of insufficient American study of this distant market, this position has been lost. After the war, Turkey had to build up a new industry with the smallest possible means. The necessary result was that Turkey had to look for lowest tool prices.

Industrially the country thus fell behind, production became poor, and this fact was employed by German makers—through good connections with Austrian exporters, as well as through very intense advertising—to offer their machines in Turkey. This advertising campaign was not restricted to Turkey.

Under sponsorship of National Research Council, industrial executives and bankers tour country to inspect research laboratories. Forty-seven strong, they visit Nela Park where this photograph was made

The German export surplus for September was more than $92,000,000, which sets another all-time high mark, exceeding the record August surplus by more than $9,000,000. These September gains bring the total German export surplus for the first nine months of the year up to $457,000,000. The monthly average is about $51,000,000.

As it is to be expected that this average will at least be maintained in the remaining three months of the year, the total surplus at the end will be about $610,000,000. The huge surplus is due both to an increase in exports—which advanced, as compared with August, by nearly $8,000,000 to a total of about $199,000,000, including reparation deliveries in kind—and the curtailment of imports, which declined by $1.500,000 to $107,000,000.

BUSINESS ITEMS

The Sprague-Sells division of the Food Machinery Corp., has announced the erection of a $150,000 addition to its Hoopeston, Ill., plant before the first of the year and that its Buffalo, N. Y., plant and Chicago sales office will be transferred to Hoopeston. The community has pledged $50,000 toward the factory construction and officials have announced that they plan a full-time normal working force by Feb. 1. The foundry schedule was in operation last week and other departments will be opened shortly.

General Machinery Co., Spokane, Wash., announces plans for building a die and casting plant and foundry, expending $30,000. The plant will be located on a site formerly occupied by the Armstrong Ice Machinery Co.

Additions to the welding and brazing and to the machine shops of the plant of the Boeing Airplane Co., Seattle, Wash., are being built under direction of the Austin Co. The new buildings will be 220 x 40 and 200 x 20 ft., steel frame, concrete walls and floors. The Boeing Co. has large naval contracts in hand. Cost of the improvement will be $30,000.

Hardinge Brothers, Inc., manufacturers of precision bench lathes, tool room lathes, bench milling machines and collets since 1890, have completed transfer of their general offices and factory to a newly constructed plant at Elmira, N. Y. A Chicago sales office is being maintained at 4553 Diversey Ave. Plans for this move were announced in *American Machinist*, p. 582i, Vol. 75.

Arthur A. Crafts Co., Boston, Mass., manufacturer of industrial diamond tools, has moved to 161 Brookline Ave., where four times its former space is available to take care of increased demand. The company expects to increase employees and add new machinery.

The Olympic Foundry Co., Seattle, Wash., has installed a light casting department for the manufacture of oil burner parts, cast-iron plumbing specialties, hardware specialties and other small castings.

The Western Cartridge Co., Alton, Ill., has acquired the Winchester Repeating Arms Co., New Haven, Conn., subject to approval by bondholders and the Federal District Court. If the arrangement is confirmed, operations will be continued at the New Haven plant, Western Cartridge assuming control Jan. 1. Western Cartridge is a large manufacturer and distributor of munitions and brass products, with plants at East Alton.

The Doehler Die Casting Co., New York, N. Y., and the Bohn Aluminum & Bronze Corp., have announced an arrangement by which Doehler takes over the Bohn Die Casting Division in exchange for the Doehler permanent mold department.

Whitman & Barnes, Inc., Detroit, has licensed the following die shops to service Hercules interchangeable punches and retainers and build special punch retainer plates using the Hercules principle: Milwaukee Press & Machine Co., Milwaukee, Wis.; Quality Hardware & Machine Corp., Chicago, Ill.; F. M. Stambaugh & Sons, Inc., St. Louis, Mo.; Buerk Tool Co., Buffalo, N. Y.; W. M. Steele Co., Worcester, Mass.; R. G. Smith Tool & Mfg. Co., Newark, N. J.; Schlosser Brothers, Philadelphia, Pa.; Interstate Mechanical Laboratories Inc., New York, N. Y.; Allen Tool Corp., Syracuse, N. Y.; The Taft-Peirce Mfg. Co., Woonsocket, R. I., and the Superior Die Tool & Machine Co., Columbus, Ohio.

The Northwest Bolt & Nut Co. is the new name of the Ballard Drop Forge Co., 4518 14th Ave., Northwest, Seattle, Wash. The change was made because the former name did not indicate that the plant makes bolts, nuts, rivets, pipe bands for wooden water pipes and cable guard rail fittings for use on public highways. W. R. YEAKEL is president and S. K. BEATTIE, treasurer.

The Hamilton Standard Propeller Corp., Homestead, Pa., has been reorganized as the Hamilton Standard Propeller Co. under Delaware laws, and will be established at Hartford, Conn. It is the propeller manufacturing subsidiary of the United Aircraft & Transport Corp. FREDERICK B. RENTSCHLER, president of United Aircraft & Transport, was elected chairman of the directorate. Other officers are: President, RAYCROFT WALSH; vice-president, ARVID NELSON; secretary, SIDNEY A. STEWART; treasurer, J. REID MILLER. The company will manufacture in a part of the plant of the Pratt & Whitney Aircraft Co., East Hartford, until such time as more space may be required. The board of directors includes EUGENE E. WILSON, president of the Chance Vought Corp. and Sikorsky Aircraft Co.; WILLIAM E. BOEING, chairman of the United Aircraft & Transport Corp.; and DON L. BROWN, president of the Pratt & Whitney Aircraft Co. and of United Airports of Connecticut, Inc.

J. L. Lucas & Son, Inc., Bridgeport, Conn., re-builders of machine tools, have established their export department at 44 Whitehall St., New York City, under the direction of Pablo Homs, Inc., export manager.

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has moved its Seattle, Wash., office from 1743 First Ave. South to 3201 First Avenue South, and C. KIRK HILLMAN has been appointed district manager.

The D. R. Campbell Machine Co., 55 Mildred Ave., Dorchester, Mass., is extending its plant and erecting an additional story, and will install new equipment and increase employees.

The Anderson (Ind.) Battery Co. is requesting quotations on complete equipment for the manufacture of automobile batteries for a new addition just completed.

PERSONALS

RALPH D. NYE, recently chief engineer for the Wheeling (W. Va.) Mold & Foundry Co., has joined the Lewis Foundry & Machine Co., Coraopolis, Pa., on sales and engineering work.

L. W. ERICKSON will succeed E. L. PARSONS as district representative on IXL gears and speed reducers for the Milwaukee and Wisconsin territory of the Foote Bros. Gear & Machine Co.

MAX EPSTEIN, chairman of the board, General American Tank Car Corp., Chicago, Ill., has been elected a member of the board of trustees of the University of Chicago.

ROBERT A. BLAIR of the Perry Furnace Co. has been elected president of the Foremen's Association just formed in the Erie (Pa.) district.

O. A. AHLERS has become purchasing agent of the City Machine & Tool Works. He was formerly assistant secretary-treasurer and purchasing agent of the International Tool Co.

IRVING H. CHASE, president of the Waterbury (Conn.) Clock Co., has been elected chairman of the directorate, and C. W. CURTIS, Orange, N. J., has been named to succeed Mr. Chase as president. Mr. Chase has been head of the company for 20 years and has been associated with it for 50 years.

GEORGE H. CORLISS, who for the past fifteen years has been advertising manager of the S. A. Woods Machine Co., Boston, has been appointed advertising and sales promotion manager of the J. A. Fay & Egan Co., Cincinnati.

C. A. CLAYPOOL, branch manager for the International Harvester Co., Fort Dodge, Iowa, was retired from active service Oct. 16 after nearly forty years with the company.

A. L. DELEEUW, consulting engineer of Plainfield, N. J., spoke on "Physical Properties of Steel Relative to Design," at the first fall meeting of the Hartford Chapter, A.S.S.T., Oct. 14. Mr. DeLeeuw called attention to the lack of metallurgical data which the designer can use directly in his daily problems. To determine the applicability of a newly advertised material he must take the static tensile properties given by the manufacturer and by means of empirical formulas, which may not be accurate for the material, perform numerous calculations to convert the data to the form which he requires. Steel compositions without number are offered but no guidance is given to the designer regarding the proper selection for his particular application. Mr. DeLeeuw did not put the entire burden upon the metallurgist, but said that some means of better cooperation between designing engineer and metallurgist must be found if the advantages of metallurgical improvements are to be fully used. Other speakers of the evening included president-elect A. H. D'ARCAMBAL and WILLIAM EISENMAN, national secretary.

H. J. CARMICHAEL, president of the McKinnon Industries branch of General Motors of Canada, Ltd., St. Catherines, Ont., announces that arrangements have been completed for the manufacture of five units of motor car production at the McKinnon plant, including steering gears, shock absorbers, ignition coils, spark plugs and axle shafts.

RADCLIFFE DENNISTON, a founder and vice-president of the Clum Mfg. Co., Milwaukee, maker of automobile switches and other equipment, and Spencer A. Pease, secretary and sales manager, have resigned to organize the United Sales Co., Plankinton Bldg., Milwaukee, to act as national distributor of small automotive products.

E. R. DOUGHERTY has joined the American Manganese Steel Co. (Chicago Heights, Ill.) sales organization, and will work with E. F. MITCHELL, district manager, in Chicago and surrounding territory. The company's Chicago office is at 1414 McCormick Bldg.

GEORGE W. DAVIES, formerly assistant secretary and treasurer, Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., has become assistant to the president of the Lakey Foundry & Machine Co., Muskegon, Mich.

DR. HELLMUTH HENDRICH, German specialist in construction and layout of industrial plants, is visiting various American plants. He is an employee of the German government and has most recently been at the Gary, Ind., works of the Illinois Steel Co.

J. P. JONES, manager of the machinery manufacturers section of the industrial department, General Electric Co., has been appointed district manager of the industrial department, east central district, to succeed L. U. MURRAY, according to an announcement by W. J. HANLEY, commercial vice-president. J. J. HUETHER has been appointed to succeed Mr. Jones as manager of the machinery manufacturers section, industrial department, according to an announcement by W. W. MILLER, manager of that department.

E. C. PATTERSON, general manager of the Chattanooga (Tenn.) Boiler & Tank Co., was re-elected president of the Chattanooga Manufacturers' Association at the first meeting of the new board of governors recently. FRANK STEFFNER was elected first vice-president; CARL WEIGEL, second vice-president; W. A. SEAGLE, treasurer; E. DEL WOOD, general secretary.

DR. MICHAEL I. PUPIN of Columbia University will receive the John Fritz Gold Medal, highest of American engineering honors, for his achievements as "scientist, engineer, author, inventor of the tuning of oscillating circuits and the loading of telephone circuits by inductance coils." The award, which was unanimous, was made by a board representing the four national engineering societies. Dr. Pupin is professor of electro-mechanics and a director of the Phoenix Research Laboratory at Columbia.

FRANK L. EIDMAN, Professor of Mechanical Engineering, Columbia University, New York City, has been appointed director of the research and experimental laboratories of the General Time Instruments Corp., which is the holding company of the Western Clock Co., the Seth Thomas Clock Co., the Stirling Clock Co., and the Hamilton-Sangamo Co. He will retain his university connection.

HARRY J. FISHER, formerly sales manager, Reliance Electric & Engineering Co., Cleveland, Ohio, will become manager of sales, Aetna-Standard Engineering Co., Youngstown, Ohio, effective Nov. 2.

H. D. REED, of the Bishop Wire & Cable Co., New York City, has been appointed National Electrical Manufacturers' Association representative on the Standards Council of the A.S.A., and H. A. CALDERWOOD, electrical engineer, National Molding Division, Electrical Products Corp., Pittsburgh, Pa., has been appointed alternate. Mr. Reed succeeds R. W. E. MOORE.

JAMES R. SHELDON, New York, N. Y., has been elected vice-president of the Beardsley & Wolcott Mfg. Co., Waterbury, Conn. Mr. Sheldon and FREDERICK W. JUDSON, president of the Waterbury National Bank, have been elected members of the board to fill vacancies caused by the resignations of GEORGE T. WIGMORE, Naugatuck, Conn., and MASON T. ADAMS, Thomaston, Conn. PHILIP CAIN was appointed assistant treasurer.

LAWRENCE R. TIERNEY has joined the Philadelphia district sales organization of the Debevoise-Anderson Co., with offices in the Stephen Girard Bldg., Philadelphia.

DR. MAXIMILIAN TOCH, president of Toch Bros., Inc., will speak on "The History of Protective Coatings," at the Nov. 5 meeting of the New York section, A.S.T.M., in the Hotel Paramount. The general subject of the meeting is "Non-Metallic Protective Coatings"; DR. HENRY A. GARDNER will speak on "The Economics of Paint," and DR. JAMES K. HUNT, of the duPont Experimental Station, will speak on "The Failure of Non-Metallic Coatings."

"Metals" will be the topic at the winter meeting, to be held Feb. 19, in cooperation with the Institute of Metals Division, Iron & Steel Division and the New York Chapter of the A.I.M.E. DR. S. W. STRATTON will speak on "Recent and Prospective Developments in Engineering Materials" at the Spring Meeting in April, 1932.

GEORGE E. TOTTEN has been appointed manager of sales of the Tin Plate Division of Republic Steel Corp., Youngstown, Ohio, with headquarters in the general offices in Youngstown.

N. E. WAHLBERG, chief engineer of the Nash Motors Co., Kenosha, Wis., since the company's founding in 1916, has been elected vice-president in charge of engineering.

FRED A. WALES has been elected president of Aluminum Colors, Inc., owner of the Alumilite process for treating and coloring aluminum and its alloys. Mr. Wales became associated with the company shortly after it was organized in 1929 and in the capacity of vice-president he was actively engaged in the development of the process. RALPH E. PETTIT has been appointed sales engineer. He was formerly in the research department of the Aluminum Co. of America. Offices of the company have recently been moved from 401 Michigan St. to 537 East Washington St., Indianapolis, Ind.

OBITUARIES

FREDERICK L. CONRAD, 51, a founder and secretary of the Moe-Bridges Co., Milwaukee, died Oct. 10 after a brief illness.

JOHN S. COX, 78, formerly chief engineer of the Lackawanna Steel Co., died last week in Buffalo, where he had resided since retirement.

W. SHIVES FISHER, 77, formerly president of the Canadian Manufacturers' Association, died at St. John, N. B., Oct. 15.

OTTO KOHLER, an organizer and president of the Meadville Malleable Iron Co., Meadville, Pa., died recently.

HENRY A. MAGOUN, 68, for 20 years vice-president and general manager of the New York Shipbuilding Corporation, Camden, N. J., died suddenly Oct. 25 at Bath, Me., where he had lived since his retirement 5 years ago.

WILLIAM SAXON, 74, vice-president in charge of manufacturing of the Miehle Printing Press & Mfg. Co., Chicago, died there Oct. 5. He had been with the company from 1889 until his recent inactivity because of illness.

LOUIS SCHLESINGER, 75, founder of the Bradley Washfountain Co., Milwaukee, died Oct. 11.

GEORGE M. TREFTS, 81, president of Farrar & Trefts, Buffalo, N. Y., boiler, engine and casting makers, died Oct. 18 at his home in Hamburg, near Buffalo, after a four-day illness.

ROBERT WISE, 54, president and treasurer, Buckeye Products Co., foundry supply manufacturer, Cincinnati, died recently there.

MEETINGS

AMERICAN MANAGEMENT ASSOCIATION
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Nov. 11-13 Headquarters, 20 Vesey St., New York.

INTERNATIONAL ACETYLENE ASSOCIATION
Thirty-second Annual Convention, Congress Hotel, Chicago, Nov. 11-13. Headquarters, 30 East 42nd St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 25-29. John A. C. Warner, secretary, 29 West 39th St., New York, N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ala., Anniston—Quartermaster General, Washington, D. C., awarded contract for the construction of a 102 x 138 ft. garage at Army Post, Fort McClellan near here. Estimated cost $24,200.

Calif., Los Angeles—Goodwill Industries, 342 North Maine St., preparing plans for a 3 story, 70 x 145 ft. industrial building at San Fernando Road and Pasadena Avenue. Estimated cost $60,000. Marsh, Smith & Powell, 516 Architects Building, Archts.

Calif., San Diego—County of San Diego plans the construction of a warehouse and garage at 15th and F Sts. Estimated cost $200,000.

Conn., Meriden—International Silver Co., J. A. Hutchinson, 48 State St., awarded contract for alterations to buildings 1 and 2, Factory E.

Ill., Chicago — Chicago Shipbuilding Co., Calumet Ave. and 101st St., plans a 1 story, 30 x 190 ft. addition to plant.

Ill., Peoria — Board of Education, awarded contract for the construction of Theodore Roosevelt junior high school, 2 and 3 story, 250 x 450 ft., including shops, etc. $630,468. Noted July 23.

Ind., Evansville—Standard Oil Co., 137 West 11th St., will build a service station at Franklin and Fulton Aves. Estimated cost $40,000. Work will be done by separate contracts. Noted Jan. 29.

Ind., Fort Wayne — Wayne Co., Tecumseh St., awarded contract for a factory building at Canal and Tecumseh Sts. Estimated cost $40,000.

Ind., Indianapolis—Beach & Arthur Inc., 221 West South St., manufacturers of paper, will build a 1 story, 40 x 104 ft. addition to factory at 2900 Columbia Ave. Estimated cost $40,000. Work will be done by owner's forces.

Mass., Boston—Lewis Wharf Corp., 39 Lewis Wharf, awarded contract for reconstruction of manufacturing building, destroyed by fire.

Mass., Cambridge (Boston P.O.)—School Building Commission, will receive bids about December 1 for a 3 story technical school at Broadway and Irving St. Estimated cost $1,500,000. R. H. Doane, 60 Batterymarch St., Boston, Archt. Noted Sept. 17.

Mass., Quincy (Boston P. O.)—New England Terminal Co., M. P. Shoahan, 45 Bates Ave., plans the construction of an oil tank terminal including thirty-two storage tanks, garage, office building and pump house, etc. Estimated cost $2,000,000. Private plans.

Mass., Quincy (Boston P. O.)—Quincy Oil Co., 58 Federal Ave., is having plans prepared for a bulk oil station including garage, warehouse, storage tanks and office on Federal Ave. Estimated cost $500,000. G. E. St. Laurent, c/o owner, Archt. Noted May 21.

Mich., Muskegon—Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., awarded contract for a factory and service building here. Estimated cost $65,000.

Minn., Minneapolis—Treasury Dept., Office of J. A. Wetmore, Supervising Architect, Washington, D. C., plans the construction of a garage and repair shop at Nicollet Ave., Third Ave. S. First and High Sts. Magney & Tusler, 104 South 9th St., Archts.

Minn., St. Paul — Joseph Friedman, 436 Wabasha St., is having plans prepared for a 175 x 300 ft. store and garage building at Eighth, Ninth, Cedar and Minnesota Sts. Estimated cost $1,000,000. Ellerbe & Co., 525 Minnestoa Bldg., Archts.

Mo., Kansas City—Nilson Bros. Planing Mill & Cabinet Factory, c/o Earl Nilson, will build a 1 story, 62 x 101 ft. mill work plant at 42nd and Michigan Sts. Work will be done by separate contracts.

N. J., Elizabeth—Elizabeth Lumber Co., M. Goldberg, 1057 East Grand St., will soon award contract for the construction of a 2 story factory. Estimated cost $40,000. Joseph Anderson, 251 North Broad St., Archt.

N. J., Newark—Board of Commissioners, City Hall, awarded general contract for a 2 story, 180 x 190 ft. automobile service, repair shop and garage on Victoria St. Estimated cost $300,000. Noted Sept. 3.

N. J., Short Hills—Cora Hartshorn, c/o Bernhardt E. Muller, 33 West 42nd St., New York, Archt., awarded contract for a 1 story farm machinery building here. Estimated cost $40,000.

N. J., Union City—Owner, c/o John G. Helmers, 147 Summit Ave., Archt., is having preliminary plans prepared for a 2 story garage, location not yet determined. Estimated cost $150,000.

N. Y., Brooklyn—E. Burak, 220 Meeker Ave., is having sketches made for a 100 x 140 ft. service garage at Meeker Ave. and Stewart St. Estimated cost $40,000. M. Klein, 65 Court St., Archt.

N. Y., Brooklyn—M. H. Renken Dairy Co., 584 Myrtle Ave., is having sketches made for the construction of a 2 story service garage and storage and dairy building at Classon St. and Myrtle Ave. Estimated cost $40,000. Koch & Wagner, 32 Court St., Archts.

N. Y., Comstock—Dept. of Correction, State Office Bldg., Albany, awarded contract for the construction of a garage, machine shop and blacksmith shop at Great Meadow Prison here. Estimated cost to exceed $40,000. Noted Aug. 27.

N. Y., New York—Atlas Organ Co., 726 Jackson Ave., will award contract about November 15 for the construction of a 2 story, 44 x 103 ft. pipe organ manufacturing plant at 239th St. and Bullard Ave. for Paul Sowada, 369 Palmer Ave., Yonkers (builder). Estimated cost to exceed $40,000. Noted Oct. 15.

N. Y., Ossining—Dept. of Correction, State Office Bldg., Albany, will receive bids until December 10 for construction, heating, and electric work, etc., for power house and shop, tunnels, heating and electric connections and apparatus at Sing Sing Prison here.

N. Y. Poughkeepsie—Dept. of Architecture, State Office Bldg., Albany, will receive bids until Nov. 6 for construction of shop and storage building for Department of Public Works here.

N. Y., St. George (sta. Staten Island)—W. C. Martin, Supt. of School Buildings, Board of Education, Flatbush Ave. Ext. and Concord St., Brooklyn, awarded contract for a vocational school at Wall St., St. Marks Pl. and Belmont Pl., here. $726,000. Noted August 13.

N. C., Canton—Champion Fibre Co., R. B. Robertson, Pres., plans to expend $1,000,000 for enlargement of paper manufacturing plant consisting of three new buildings. Machinery and equipment to cost $500,000 will be required.

N. C., Marble — Columbia Marble Co., 303 Scottish Park, Koxville, Tenn., plans a marble finishing plant here. Estimated cost $125,000.

N. C., Mayodan — Washington Mills Co., awarded contract for the construction of a 4 story, 100 x 100 ft. mill. Estimated cost $50,000.

O., Cincinnati—Kroger Grocery & Baking Co., 35 East Seventh St., will soon award contract for construction of food manufacturing plant, garage and service buildings. Estimated cost to exceed $250,000.

O., Cleveland—Midland Steel Products Co., Madison Ave. and 106th St., plans additions and improvements to factory for the manufacture of automotive specialties. Estimated cost $100,000.

O., Mansfield—Martin Steel Products Co., manufacturers of portable steel buildings, etc., plans reconstruction of part of factory recently destroyed by fire. Loss $100,000.

O., Dayton—Premier Rubber Mfg. Co., 38 South Jefferson St., awarded contract for a 1 story, 60 x 100 ft. factroy. Estimated cost $50,000.

Okla., El Reno—Bureau of Federal Prisons, Washington, D. C., is having plans prepared for the construction of a group of buildings including power house, laundry and shop building, dormitories, etc. Estimated total cost $643,000. James A. Wetmore, Washington, D. C., Acting Supervising Architect, and Hawk & Parr, 1019 Hales Bldg., Oklahoma City, Archts.

Wash., Seattle — Boeing Airplane Co., 320 West Front St., manufacturers of passenger transport airplanes, awarded contract for three additions to plant, all 1 story including 20 x 200 ft. welding shop, 40 x 200 ft. brazing shop and 40 x 200 ft. machine shop. Estimated cost $50,000.

Wis., Sheboygan—Hayssen Mfg. Co., manufacturers of bread wrapping machinery, is having plans prepared for a 2 story addition to shop building and boiler house.

N. S., Baddeck—North American Gypsum Co., plans the construction of a gypsum plant. Estimated cost $150,000.

Ont., Guelph—Canada Gypsum Co., Hagersville, awarded contract for a 1 story factory and four new kilns here. New machinery and equipment will be required.

Ont., Sudbury—Sudbury High School Board is having plans prepared for addition to mining and technical school. Estimated cost $250,000. P. G. O'Gorman, Sudbury, Archt.

Equipment Wanted

Mo., St. Louis—John Ballak, 100 North 12th St.—smallband saw.

Pa., Philadelphia—Board of Education, Administration Building, 19th St.—manual training equipment for proposed junior high school at 59th St. and Malvern Ave. Estimated cost $762,000.